

DOCUMENT RESUME

ED 079 154

SE 016 542

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TITLE A Supplementary Program for Environmental Education,
Industrial Arts, Grade 9-12.
INSTITUTION Project I-C-E, Green Bay, Wis.
SPONS AGENCY Bureau of Elementary and Secondary Education
(DHEW/OE), Washington, D.C.
PUB DATE 72
NOTE 99p.
EDRS PRICE MF-\$0.65 HC-\$3.29
DESCRIPTORS Behavioral Objectives; *Environmental Education;
Fundamental Concepts; *Industrial Arts; Instructional
Materials; Interdisciplinary Approach; Learning
Activities; *Lesson Plans; *Secondary Grades;
*Teaching Guides
IDENTIFIERS ESEA Title III

ABSTRACT

Presented in this teacher's guide for grades 7-12 are lessons plans and ideas for integrating industrial arts (power mechanics, graphic arts, plastics, and electricity/electronics) and environmental education. Each lesson originates with a fundamental concept pertaining to the environment and states, in addition, its discipline area, subject area, and problem orientation. Following this, behavioral objectives and suggested learning experiences are outlined. Behavioral objectives include cognitive and affective objectives and skills to be learned, while learning experiences list student-centered in-class activities and outside resource and community activities. Space is provided for teachers to note resource and reference materials--publications, audio-visual aids, and community resources. The guides are supplementary in nature and the lessons or episodes are designed to be placed in existing course content at appropriate times. This work was prepared under an ESEA Title III contract for Project I-C-E (Instruction-Curriculum-Environment). (BL)

ED 079154

Project I - C - E

INSTRUCTION - CURRICULUM - ENVIRONMENTAL

THIS DOCUMENT
THE PERFORMING
STATE OF
EDUCATION

A SUPPLEMENTARY PROGRAM FOR ENVIRONMENTAL EDUCATION

DISCIPLINE AREA Industrial Arts GRADE 9-12

1. Power Mechanics
2. Graphic Arts
3. Plastics
4. Electricity - Electronics

Produced under Title III E.S.E.A.
PROJECT I-C-E
Serving Schools in CESA's 3-8-9
1927 Main Street
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ENVIRONMENTAL EDUCATION

Arts GRADE 9-12

Mechanics

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3-8-9

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7464)

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Howl

PREFACE

"Oikus" for house is the Greek origin of the term. "ec studies our house--whatever or wherever it may be. Lik expand or contract to fit many ranges--natural and man- environments, our many "houses" if we omit rancor and c complexities. Our "oikus" uses the insights of all sub multidisciplinary program like ours necessarily results a long time, our program ranges K thru 12. The environ values. These values have their origin in the "oikus" minds. Let us become masters of our house by replacing with "Know thyself and thine house."

1. Written and designed by your fellow teachers, this g to fit appropriately into existing, logical course c
2. Each page or episode offers suggestions. Knowing yo to adapt or adopt. Limitless chances are here for y Many episodes are self contained, some open-minded, developed over a few days.
3. Try these episodes, but please pre-plan. Why? Simp and no curriculum will work unless viewed in the con
4. React to this guide with scratch ideas and notes on
5. After using an episode, fill out the attached evalua duplicate, or request more of these forms. Send the We sincerely want your reactions or suggestions--neg evaluations are the key in telling us "what works" a the guides.

TERMS AND ABBREVIATIONS

ICE RMC is Project ICE Resource Materials Center serv school districts in CESA 3, 8, and 9. Check the Projec resources. Our address and phone number is on this gui or call us for any materials or help.

BAVI is Bureau of Audio visual Instruction, 1327 Univ Madison, Wisconsin 53701 (Phone: 608-262-1644).

Cognitive means a measurable mental skill, ability, o Affective refers to student attitudes, values, and fe

PREFACE

is the Greek origin of the term "ecology". Environmental education wherever or wherever it may be. Like an umbrella, our house can fit many ranges--natural and man-made. We can add quality to our "houses" if we omit rancor and cite long range gains, costs, and "oikos" uses the insights of all subjects. Thus, a rational, positive program like ours necessarily results. Also, since attitudes grow over time from ranges K thru 12. The environment mirrors our attitudes or have their origin in the "oikos" of our collective and individual masters of our house by replacing the Greek adage of "Know thyself" and thine house."

ed by your fellow teachers, this guide is supplementary in nature--ly into existing, logical course content.

de offers suggestions. Knowing your students best, you decide what Limitless chances are here for your experimentation and usage. self contained, some open-minded, still others can be changed or few days.

, but please pre-plan. Why? Simply, no guide has all the answers, will work unless viewed in the context of your students.

be with scratch ideas and notes on the episode pages.

isode, fill out the attached evaluation form in the back. Use, best more of these forms. Send them singly or collectively to us. your reactions or suggestions--negative and positive. Your e key in telling us "what works" and in aiding our revisions of

IONS

ICE Resource Materials Center serving all public and non-public ESA 3, 8, and 9. Check the Project ICE Bibliography of available ss and phone number is on this guide's cover. Feel free to write materials or help.

udio Visual Instruction, 1327 University Avenue, P. O. Box 2093, 701 (Phone: 608-262-1644).

measurable mental skill, ability, or process based on factual data. student attitudes, values, and feelings.

ACKNOWLEDGEMENTS: The following teachers and consultants participated in the development of the Supplementary Environmental Education materials.

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Krueger, Winneconne
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Jan Serrahn, Sevastopol
Calvin Siegrist, How.-Suam.
Mary Smith, Green Bay
Carol Trimberger, Kewaunee
Mary Wadzinski, How.-Suam.

C 1. Energy from the sun, the basic
 O source of all energy, is converted
 N through plant photosynthesis into
 C a form all living things can use
 E for life processes.

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ESEA Title III - 59-70-0135-2 Project I-C-F

BEHAVIORAL OBJECTIVES

Cognitive: The student will be able to write a short paragraph briefly explaining the relationship of sun energy to fuel sources.
Affective: The student will gain an appreciation for the role of the sun in raw fuel production.

Skills to be Learned

1. How fuels are formed.
2. How fuels are refined.
3. How fuels are used.

II. Student-Centered activity

- A. Thru class develop a combustible
 1. Oil
 - a. Gasol
 - b. Fuel
 - c. Keros
 - d. Tar.
 2. Coal
 - a. Gas
 - b. Coke
 3. Natural
 4. Wood
 - a. Turpe
 - b. Wood
- B. How was/is responsible "fuels"?
- C. How is sun released fr
 1. Burn som in a par release.
- D. Films "Refi
 "Story of G

sun, the basic

is converted

synthesis into

things can use

Discipline Area Industrial Arts

Subject Power Mechanics

Problem Orientation Fuel Sources & The Sun Grade 9-12

SUGGESTED LEARNING EXPERIENCES

- II. Student-Centered in class activity
- A. Thru class discussion develop a list of combustible fuel sources.
1. Oil
 - a. Gasoline
 - b. Fuel oil
 - c. Kerosene
 - d. Tar.
 2. Coal
 - a. Gas
 - b. Coke
 3. Natural gas
 4. Wood
 - a. Turpentine
 - b. Wood alcohol
- B. How was/is sun energy responsible for these "fuels"?
- C. How is sun energy released from fuel?
1. Burn some fuel oil in a pan to demonstrate release.
- D. Films "Refinery at Work"
"Story of Gasoline"

- I. Outside Resource and Community Activities
1. Field trip to refinery.
 2. Representative from petroleum industry.

Resource and Reference Materials

Publications:

Auto Mechanics I ndamentals,

Martin W. Stockel

Goodheart-Willcox

Audio-Visual:

Refinery at Work, Shell film
Library

Story of Gasoline :

U. S. Bureau of Mines

#52385 Conserving Our Natural
Resources, Univ. of Ill.

#00864 Treasures of The Earth,
University of Ill, Champaign,

Community:

1. Representative from petroleum industry.
2. Fuel Oil Dealer.
3. Combastion engineer.

Continued and Additional Suggest al

1. Develop collection of "fuel
2. Develop bulletin board of (refined)
3. Develop bulletin board of a

ge als

Continued and Additional Suggested Learning Experiences

1. Develop collection of "fuels" both raw & refined.
2. Develop bulletin board of fuel cycle (sun-raw-refined)
3. Develop bulletin board of a refinery process.

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2. All living organisms interact
among themselves and their
environment, forming an intricate
unit called an ecosystem.

Discipline
Subject
Problem Orier

ESEA Title III -59-70-0135-2 Project I-C-E	BEHAVIORAL OBJECTIVES	SUGGESTED
	<p><u>Cognitive:</u> The student will name and compare in writing the four basic systems of an internal combustion engine to the systems of existence.</p> <p><u>Affective:</u> The student will realize the interaction between the four basic systems of an internal combustion engine and the effects produced if one or more systems fail to function properly.</p>	<p>I. Student-Centered in c activity</p> <p>A. Film on internal c ion.</p> <p>B. Transparency serie discussion of basi internal combustio</p> <p>1. Fuel</p> <p>2. Electrical</p> <p>3. Cooling</p> <p>4. Exhaust</p> <p>C. Discuss function & importance of gauge performance indicat</p> <p>D. Develop flow chart what results if one these systems or ga fails to function p</p> <p>E. Compare basic syste their functions to living in todays wo (Compares to) egs.</p> <p>1. Engine--Living i general.</p> <p>2. Fuel---Gas, oil, electricity.</p> <p>3. Cooling Air, wa</p> <p>4. Exhaust--Waste d</p>
	<p><u>Skills to be Learned</u></p> <p>1. Principles of internal combustion.</p> <p>2. Systems analysis</p> <p>3. Basic systems of internal combustion</p> <p>a. Fuel</p> <p>b. Electrical</p> <p>c. Cooling</p> <p>d. Exhaust</p> <p>4. Systems necessary to human existence.</p>	

mechanisms interact

and their

Discipline Area Industrial Arts

ing an intricate

Subject Power Mechanics

system.

Problem Orientation Internal Combustion vs. External Existence
Grade 10-12

VALUES	SUGGESTED LEARNING EXPERIENCES	
ation	I. Student-Centered in class activity A. Film on internal combustion. B. Transparency series & discussion of basic internal combustion systems 1. Fuel 2. Electrical 3. Cooling 4. Exhaust C. Discuss function & importance of gauges or performance indicators. D. Develop flow chart on what results if one of these systems or gauges fails to function properly. E. Compare basic systems & their functions to people living in today's world. (Compares to) egs. 1. Engine--Living in general. 2. Fuel--Gas, oil, food, electricity. 3. Cooling--Air, water. 4. Exhaust--Waste disposal	II. Outside Resource and Community Activities A. Sociologist B. Have students find examples in community and determine basic integral systems and their functions.
onal	(Con't)	

Resource and Reference Materials Continued and Additional Suggest

Publications:

(Con't from I.)

5. Gauges--Communications

(Con't from II.)

1. Have students find other interaction in the community them identify the basic define their functions.

Audio-Visual:

Film- ABC's of Internal Combustion,
Gen. Motors

Community:

I. Sociologist

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s Continued and Additional Suggested Learning Experiences

(Con't from I.)

5. Gauges--Communications

(Con't from II.)

1. Have students find other examples of interaction in the community and have them identify the basic systems and define their functions.

tion,

C O N C E P T	3. Environmental factors are limiting	
	on the numbers of organisms living	Discipline
	within their influence, thus, each	Subject
	environment has a carrying	Problem Ori
	capacity.	

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: Students will orally, or in writing, list and illustrate at least three physical and three psychological effects of crowding.

Affective: The student will realize that crowding results in adverse physical and psychological effects.

Skills to be Learned
Hazards in environmental crowding.

SUGGESTED

- I. Student-Centered in activity
 - A. Conduct experiment the following conditions
 1. Develop simple students, in pairs will disassemble a single cylinder
 2. Provide only one of tools req'd.
 3. Limit work area one table.
 4. Limit time.
 5. First team finishes
 - B. Discuss personal and feelings experienced experiment,
 1. Low production
 2. Confusion
 3. Frustration
 4. Irritability
 5. Waste
 6. Injury
 - C. What is the result of this happened in today's world?
 - D. Relate experienced to concept #3.

factors are limiting

of organisms living Discipline Area Industrial Arts
fluence, thus, each Subject Power Mechanics
a carrying Problem Orientation Crowding in the Grade 9-12
shop.

SUGGESTED LEARNING EXPERIENCES

will g, at and effects	<p>I. Student-Centered in class activity</p> <p>A. Conduct experiment around the following conditions:</p> <ol style="list-style-type: none">1. Develop simple task ie, students, in pairs, will disassemble a single cylinder engine.2. Provide only one each of tools req'd.3. Limit work area to one table.4. Limit time.5. First team finished wins. <p>B. Discuss personal and physical feelings experienced during experiment,</p> <ol style="list-style-type: none">1. Low production2. Confusion3. Frustration4. Irritability5. Waste6. Injury <p>C. What is the result if this happened in town.</p> <p>D. Relate experienced results to concept #3.</p>	<p>II. Outside Resource and Community Activities</p> <ol style="list-style-type: none">A. Psychologist.B. Community planning committee.C. Real estate developer.
ntal		

Resource and Reference Materials
Publications:

Continued and Additional Suggest

Audio-Visual:

#53525 man's Effect on the
Environment, U. of Ill, Champaign

Community:

- A. Psychologist or sociologist
- B. Community planning committee
- C. Real estate developer

est. Continued and Additional Suggested Learning Experiences

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4. An adequate supply of clean
 air is essential because most
 organisms depend on oxygen, through
 respiration, to release the energy
 in their food.

Discipline Area Industr
 Subject Power M
 Problem Orientation Water
Ener

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p>Cognitive: The student will be able to list 4 advantages & 2 disadvantages of atomic energy as a means of producing electricity.</p> <p>Affective: The student will become aware of the possible detrimental effects of producing electricity by atomic means, as well as the advantages.</p>	<p>I. Student-Centered in class activity</p> <p>A. Show films <u>Atomic Power Production, How a Boiling Water Reactor Operates</u></p> <p>B. <u>Field trip to a nuclear power plant</u></p> <p>C. Presentation by rep. from local power company.</p> <p>D. Read text units on <u>Atomic Power Production</u>.</p> <p>E. Debate in class the advantages & disadvantages of Atomic Power Production.</p>	<p>II.</p>
<p><u>Skills to be Learned</u></p> <p><u>Generation of atomic power.</u></p>	<p>F. The students will write a report on the effects on water used in the production of atomic power.</p>	

the supply of clean

fuel because most

Discipline Area Industrial Arts

depend on oxygen, through

Subject Power Mechanics

to release the energy

Problem Orientation Water Use & Atomic Grade 9-12
Energy.

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

II. dependent of mental and physical

- I. Student-Centered in class activity
 - A. Show films Atomic Power Production, How a Boiling Water Reactor Operates
 - B. Field trip to a nuclear power plant
 - C. Presentation by rep. from local power company.
 - D. Read text units on Atomic Power Production.
 - E. Debate in class the advantages & disadvantages of Atomic Power Production.
 - F. The students will write a report on the effects on water used in the production of atomic power

- II. Outside Resource and Community Activities
 - 1. Field trip to a nuclear power plant
 - 2. Local power company rep.
 - 3. D.N.R. rep.
 - 4. A.E.C. rep.

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Resource and Reference Materials Continued and Additional Suggested Learning

Publications:

Power Technology,
Geo. Stephenson,
Delman Publishing

1. Develop bulletin board on atomic energy
2. Develop a newspaper clipping file relating to energy production (community involvement)
3. Have students measure & chart water temperature at various distances from an atomic power plant to determine possible thermal pollution of water.

Audio-Visual:

#6373 Atomic Power Production,
Bay 1
#1706 How a Boiling Water
Reactor Operates, BAVI

Community:

1. Local power company rep.
2. D.N.R. rep.
3. A.E.C. rep.

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als Continued and Additional Suggested Learning Experiences

1. Develop bulletin board on atomic energy production.
2. Develop a newspaper clipping file related to atomic energy production (community involvement)
3. Have students measure & chart water temperature at various distances from an atomic power plant to determine possible thermal pollution of the water.

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5. An adequate supply of clean air
is essential because most organisms Discipline Area Ind
depend on oxygen, through respir- Subject Power
ation, to release the energy in Problem Orientation
their food.

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
<p>ESEA Title III - 59-70-0135-2 Project I-C-E</p> <p>Cognitive: 1. The students list & describe 3 emission control devices. 2. The students describe 4 advantages & disadvantages of low/no lead gasoline. 3. The students list the procedure for engine tune up. Affective: The student will have an appreciation for proper engine tune-ups.</p>	<p>I. Student-Centered in class activity A. Visit car dealership service dept. Talk on emission control devices & their maintenance. B. Round table discussion "Why do we need emission control devices" (in summation relate discussion to concept #5) C. Develop a display of emission control devices. D. Develop a service chart for EC devices. E. Debate the pros/cons of using low/no lead gasoline. F. Movies for wrap-up 1. <u>Air Pollution & Cars</u> 2. <u>The Answer is Clear</u></p>
<p><u>Skills to be Learned</u> 1. Engine tune-up procedures. 2. Use of test equip. 3. How emission control devices affect the air quality.</p>	

adequate supply of clean air

essential because most organisms

Discipline Area Industrial Arts

and on oxygen, through respir-

Subject

Power Mechanics

, to release the energy in
food.

Problem Orientation Air Pollution

Grade 9-12

TOTAL OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

1. The students describe 3 emission devices. Students describe stages & diagnoses of low/no gasoline. Students list the reasons for engine

The student has an appreciation of engine tune-

to be Learned
tune-up procedures.
test equip.
emission control
affect the
ability.

- I. Student-Centered in class activity
- A. Visit car dealership service dept. Talk on emission control devices & their maintenance.
 - B. Round table discussion "Why do we need emission control devices" (in summation relate discussion to concept #5)
 - C. Develop a display of emission control devices.
 - D. Develop a service chart for EC devices.
 - E. Debate the pros/cons of using low/no lead gasoline.
 - F. Movies for wrap-up
 - 1. Air Pollution & Cars
 - 2. The Answer is Clear

- II. Outside Resource and Community Activities
- 1. Service dept local dealership.
 - 2. Oil Co. distributor.
 - 3. D.N.R. rep.
 - 4. GM.-Ford-Am., Cry.- rep.

Resource and Reference Materials Continued and Additional Suggested Learning

Publications:

Automotive Emission Control,
Wm. H. Crouse, Gregg/McGraw-Hill
The Quest for Cleaner Air,
Motor Service, Aug. 71
Principles & Promises of the
Wankel, Road & Track Feb. 71
Those New Gasolines, Popular Mech.
Feb. 71

Audio-Visual:

To Clean the Air, United World
Free Film Service, 221 Park Ave.
N.Y. N.Y. 10003

Toward Cleaner Air, Assoc.
Sterling Film, 866 3rd Ave.
New York, N.Y. 10022

Air Pollution & Cars

The Answer is Clear

GM Corp. Public relations staff

Film library GM bldg.

Detroit, Mich. 48202

No Time To Waste

Modern Talking Picture Service

2523 New Hyde Park Rd.

Long Island, N.Y. 11040

1. Write a paper on the development of control devices.
2. Develop a graph showing % of air pollution.
3. Develop a graph of various types of control devices comparing (1) efficiency (2) % pollution (3) economy.

Community:

1. Local service dept.
2. Oil Co. dist.
3. D.N.R. rep.
4. Big 3 rep.

Materials Continued and Additional Suggested Learning Experiences

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Graw-Hill
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1. Write a paper on the development of emission control devices.
2. Develop a graph showing % of air pollution by cars.
3. Develop a graph of various types of engines comparing (1) efficiency (2) % pollution (3) economy.

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6. Natural resources are not equally distributed over the earth or over time and greatly affect the geographic conditions and quality of life.

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Subject Power
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BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
<p>Cognitive: The student will write a research paper on oil pipe lines & their impact on the environment</p> <p>Affective: The student will understand problems involved in transporting crude oil.</p>	<p>I. Student-Centered in class activity</p> <p>A. Lecture by oil co.rep. dealing with how oil deposits are located</p> <p>B. Round table discussion: Now that the oil is discovered & the well brought in how do you get it to the refinery?</p>
<p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. How crude oil is located. 2. Problems involved in transporting crude oil to refinery. 3. Community involvement. 	<p>1. Truck</p> <p>2. Boat</p> <p>3. Pipe line</p> <p>4. Railroad</p> <p>5. Combination</p> <p>C. What factors are considered in selecting a transportation system?</p> <ol style="list-style-type: none"> 1. Cost 2. Environmental impact 3. Natural terrain 4. Distance 5. Profit margin <p>D. How do the above considerations affect the quality of life at:</p> <ol style="list-style-type: none"> 1. Well site 2. Transportation route 3. Refinery site <p>(Con't)</p>

ESEA Title III -59-70-0135-2 Project I-C-E

Natural resources are not equally

distributed over the earth or

time and greatly affect the

economic conditions and quality
of life.

Discipline Area Industrial Arts

Subject Power Mechanics

Problem Orientation Transportation of Grade 9-12
Crude Oil

GENERAL OBJECTIVES

The student
do research
on pipe lines
and their effect on the
economy.
The student
understand problems
involved in
transporting

What is learned
about oil is lo-
calized
and involved
in transporting crude
oil to a refinery.
Student involvement.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
 - A. Lecture by oil co. rep. dealing with how oil deposits are located
 - B. Round table discussion: Now that the oil is discovered & the well brought in how do you get it to the refinery?
 - 1. Truck
 - 2. Boat
 - 3. Pipe line
 - 4. Railroad
 - 5. Combination
 - C. What factors are considered in selecting a transportation system?
 - 1. Cost
 - 2. Environmental impact
 - 3. Natural terrain
 - 4. Distance
 - 5. Profit margin
 - D. How do the above considerations affect the quality of life at:
 - 1. Well site
 - 2. Transportation route
 - 3. Refinery site(Cont)

- II. Outside Resource and Community Activities
 - A. Oil co. rep.
 - B. D.N.R.
 - C. Dept. of Interior

Resource and Reference Materials

Publications:

Free literature from oil companies.

Audic-Visual:

#52385 Conserving Our Natural Resources, University of Ill.

Community:

1. Oil company rep.
2. D.N.R.
3. Dept. of Interior

Continued and Additional Suggested Learning

(Con't from I.)

E. Debate pros & cons of the Trans-Ala using facts discovered by individual (Have one group research pros other

1. Develop map showing the following:
 1. Well locations
 2. Refinery locations
 3. Well to refinery routes (color code mode of transportation)
 4. Severe environment impairment sites & description of cause of impairment

Learning Activities . Continued and Additional Suggested Learning Experiences

(Con't from I.)

Trans-Alaska Pipeline Individual Research Activities. E. Debate pros & cons of the Trans-Alaska Pipe Line using facts discovered by individual research.
(Have one group research pros other group cons)

1. Develop map showing the following:
 1. Well locations
 2. Refinery locations
 3. Well to refinery routes (color code for mode of transportation)
 4. Severe environment impairment sites & description of cause of impairment.

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7. Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influence on changes in land use and centers of population density.

Discipline Area Industry
Subject Power
Problem Orientation Effect
Recreat

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING

Cognitive: The student will list 5 ways in which leisure vehicles, while contributing to our economy, are changing or damaging the environment, and changing our way of life.
Affective: The student will be aware of effects recreational vehicles are having on his surroundings, and realize its long term effects.

- Skills to be Learned
1. Research.
 2. Harmful results of leisure vehicle operation.
 3. Statistic usage.

- I. Student-centered in class activity
- A. Develop (through discussion) a list of factors which have contributed to the development & popularity of recreational vehicles.
 1. Snowmobiles
 2. Boats
 3. All terrain vehicles
 - B. Brainstorm list of detrimental effects to water, land, & air quality as a result of these vehicles.
 1. Pollution of water.
 2. Pollution of Air.
 3. Compacting of land.
 - C. Have students project (via small group conference & discussion) long-range effects of use of recreational vehicles.
 - D. Discuss movement of people to "recreational areas" for usage of leisure time.

II.

...s such as facilitating.

ustration, economic conditions, Discipline Area Industrial Arts

er growth, and increased Subject Power Mechanics

Effects have a great influence Problem Orientation Effects of Grade 9-12
reats in land use and centers Recreational Vehicles
ation density.

GENERAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
II. The student ays in which les, while to our changing e environ- ging our student of effects ehicles his sur- realize its ects.	I. Student-Centered in class activity A. Develop (through discussion) a list of factors which have contributed to the development & popularity of recreational vehicles. 1. Snowmobiles 2. Boats 3. All terrain vehicles B. Brainstorm list of detrimental effects to water, land, & air quality as a result of these vehicles. 1. Pollution of water. 2. Pollution of Air. 3. Compacting of land. C. Have students project (via small group conference & discussion) long-range effects of use of recreational vehicles. D. Discuss movement of people to "recreational areas" for usage of leisure time.	II. Outside Resource and Community Activities A. Conduct traffic surveys during different times of the year, counting number of vehicle's towing recreational vehicles, and comparing to total number of vehicles. B. Observe areas receiving heavy snowmobile traffic before & after the snowmobiling season. Compare growth of grass on trail & adjacent to it. C. Chamber of Commerce representative to point out major geographic recreation areas.
Learned ults of icle operation. usage.		

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Reference Materials	Continued and Additional Suggested Learning Experiences
<p>ocating their te r vity ic r his ecti atio</p> <p>r Graphs udents from traffic</p> <p>erce rep.</p>	<ol style="list-style-type: none">1. Create map showing geographical locations of major recreational areas and their main type of recreational activity.2. Draw charts or graphs to illustrate results of traffic survey (Community Activity A)3. Keep perpetual survey of geographic recreational area use of students in class. This will not only be of benefit in meeting objectives, but can also be used as a local recreational guide.

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C 8. Cultural, economic, social,
 O
 N and political factors determine Discipline Area Industrial
 C
 E status of man's values and attitudes Subject Power Mechan
 P
 T toward his environment. Problem Orientation Pollutio
 Devices

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPER
<p>ESEA Title III -59-70-0135-2 Project I-C-E</p> <p><u>Cognitive:</u> The student will be able to list anti-pollution devices required on internal combustion engines. The student will be able to list the cultural, social, political, and economic factors which these devices have caused.</p> <p><u>Affective:</u> The student will understand the factors which lead to the requirement of anti-pollution devices and the results of their use.</p> <p><u>Skills to be Learned</u> The operation of anti-pollution devices on internal combustion engines. Cost analysis Data gathering Data analysis</p>	<p>I. Student-Centered in class activity</p> <p>A. Students will study anti-pollution devices for internal combustion engines.</p> <p>B. Students will develop a list of social and political factors which lead to the required use of these devices.</p> <p>C. Students will figure economic factors which have resulted from the required use of these devices.</p> <p>D. Student will list cultural factors produced by the required use of these devices.</p> <p>III. Outs Comm Rep.</p>	

ic, social,

al s determine Discipline Area Industrial Arts
char es and attitudes Subject Power Mechanics
utic nt. Problem Orientation Pollution Control Grade 9-12
ces Devices.

PER S	SUGGESTED LEARNING EXPERIENCES	
Outs Comm Rep.	<p>I. Student-Centered in class activity</p> <p>A. Students will study anti-pollution devices for internal combustion engines.</p> <p>B. Students will develop a list of social and political factors which lead to the required use of these devices.</p> <p>C. Students will figure economic factors which have resulted from the required use of these devices.</p> <p>D. Student will list cultural factors produced by the required use of these devices.</p>	<p>II. Outside Resource and Community Activities</p> <p>Rep. from auto manufacturer.</p>

Resource and Reference Materials

Continued and Additional Suggested Learning

Publications:

National newspapers.
Auto Mechanics Fundamentals,
Martin W. Stockel
Goodheat-Willcox
Power Technology
George E. Stephenson
Delmar Publishing

Audio-Visual:

Charts from auto manufacturers.

Community:

Rep. from auto manufacturer.

Lea Continued and Additional Suggested Learning Experiences

C 9. Man has the ability to manage,
 O manipulate, and change his
 N environment.
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Discipline Area Industrial Art
 Subject Power Mechanic
 Problem Orientation Engine Tuning

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p><u>Cognitive:</u> The student will be able to tune-up an engine to reduce exhaust emission and increase engine efficiency.</p> <p><u>Affective:</u> The student will realize the difference proper adjustment makes in exhaust emission, both the pollution and economic standpoint.</p>	<p>I. Student-Centered in class activity</p> <p>A. Discuss increased uses of small engines in recent years.</p> <ol style="list-style-type: none"> 1. Develop a list of ways in which small engines are changing our environment. 2. Using an exhaust analyzer, test emission from a badly tuned engine. 3. Tune-up same engine and retest for exhaust emission. 	<p>II. Out-of-class</p> <p>Comm.</p> <p>A. R</p> <p>e</p>
<p><u>Skills to be learned</u></p> <p>A. Carburetor adjustment.</p> <p>B. Checking and adjusting ignition system.</p> <ol style="list-style-type: none"> 1. Plugs. 2. Points. 		

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Discipline Area Industrial Arts

Subject Power Mechanics

Problem Orientation Engine Tune-Up Grade 9-12

YES	SUGGESTED LEARNING EXPERIENCES	
ry.	<p>I. Student-Centered in class activity</p> <p>A. Discuss increased uses of small engines in recent years.</p> <ol style="list-style-type: none">1. Develop a list of ways in which small engines are changing our environment.2. Using an exhaust analyzer, test emission from a badly tuned engine.3. Tune-up same engine and retest for exhaust emission.	<p>II. Outside Resource and Community Activities.</p> <p>A. Rep. from a small engine manufacturer.</p>
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Resource and Reference Materials	Continued and Additional Suggested Learning
<p data-bbox="347 894 590 929"><u>Publications:</u></p> <p data-bbox="347 929 665 964"><u>Power Technology,</u></p> <p data-bbox="347 964 722 999">George E. Stephenson</p> <p data-bbox="347 999 665 1034">Delmar Publishers</p> <p data-bbox="347 1034 684 1069"><u>Small Gas Engines,</u></p> <p data-bbox="347 1069 544 1103">Jud Purvis</p> <p data-bbox="347 1103 665 1138">Goodheart-Willcox</p> <p data-bbox="347 1196 590 1231"><u>Audio-Visual:</u></p> <p data-bbox="347 1231 853 1266"><u>#51011 Spark In Time On The</u></p> <p data-bbox="347 1266 834 1301"><u>Firing Line, University of</u></p> <p data-bbox="347 1301 741 1336"><u>Ill., Champaign, Ill.</u></p> <p data-bbox="347 1498 534 1533"><u>Community:</u></p> <p data-bbox="347 1533 872 1568">Rep. from small engine manu.</p>	

ng Continued and Additional Suggested Learning Experiences

C O N C E P T	10. Short-term economic gains	
	may produce long-term	Discipline Area <u>Industrial</u>
	environmental losses.	Subject <u>Power Mecha</u>
		Problem Orientation <u>Disposal</u> <u>Oil</u>

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPER
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Cognitive: The student will list 3 improper oil disposal methods & write a brief description of possible long term environmental losses related to disposal.
Affective: The student will realize that improper disposal of waste oil may cause long-term environmental losses.

- Skills to be Learned
1. Environmental losses as it relates to waste oil disposal.
 2. The proper handling of waste oil.
 3. Oil changing procedure.

- I. Student-Centered in class activity
 - A. Students will survey local garages to find out how they dispose of waste oil & why they use the method they do. Assign garages so owners are not assaulted by the whole class.
 - B. Individually report on disposal method discovered
 1. Dump in sewer
 - a. Storm
 - b. Sanitary
 2. Burn
 3. Dump on land
 - a. At garage pit
 - b. Local dump
 4. Store for reclaim
 5. Personal reuse
 - C. Round table discussion
 "How Do These Disposal Methods Produce Long-Term Environmental Uses"

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Discipline Area Industrial Arts

Subject Power Mechanics

Problem Orientation Disposal of Waste Grade 9-12
Oil

SUGGESTED LEARNING EXPERIENCES

Student-Centered in class
Activity

1. Students will survey local
2. garages to find out how
3. they dispose of waste
oil & why they use the
method they do. Assign
garages so owners are
not assaulted by the whole
class.
Individually report on
disposal method discovered

1. Dump in sewer
 - a. Storm
 - b. Sanitary
2. Burn
3. Dump on land
 - a. At garage pit
 - b. Local dump
4. Store for reclaim
5. Personal reuse

Round table discussion
"How Do These Disposal
Methods Produce Long-Term
Environmental Uses"

II. Outside Resource and
Community Activities

1. Local garages.
2. Local oil company
3. See "I.-A."

Resource and Reference Materials

Publications:

1. Oil company literature.

Audio-Visual:

1. Teacher/student developed slide series.

Community:

1. Local garages.
2. Oil company rep.

Continued and Additional Suggested I

1. Have students develop alternative disposal methods that will not have detriments and/or uses for waste
2. Develop slide series on waste oil

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oil

Materials

Continued and Additional Suggested Learning Experiences

1. Have students develop alternative waste oil disposal methods that will not have environmental detriments and/or uses for waste oil.
2. Develop slide series on waste oil disposal methods.

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C -11. Individual acts, duplicated or
 O compounded, produce significant
 N environmental alterations over
 C time.

Discipline Area Industrial A
 Subject Power Mechan
 Problem Orientation Tire Sele

ESHA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERI	
<p><u>Cognitive:</u> The student will be able to list 3 good and 3 harmful effects of studded tires. <u>Affective:</u> The student will remove studded tires from his car whenever their use is not vital.</p>	<p>I. Student-Centered in class activity A. Study wheels, hubs, tires 1. Wheel parts 2. Hub lubrication 3. Tire plys 4. Tire size 5. Tire balance 6. Tire inflation 7. Tire composition B. Slide presentation on studded tire. 1. How made 2. Uses 3. Effects on road surface. 4. Regulations on use. 5. Comparison to snow tires. C. Highway engineer to make presentation on highway resurfacing due to studded tires.</p>	<p>II. Outs Comm High Tire</p>
<p><u>Skills to be Learned</u> The wearing effect studded tires have on highway surfaces. The environmental problems and economic loss involved in highway resurfacing.</p>		

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chan over Subject Power Mechanics

Sele Problem Orientation Tire Selection Grade 9-12

SUGGESTED LEARNING EXPERIENCES

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High
Tire

- I. Student-Centered in class activity
- A. Study wheels, hubs, tires
 - 1. Wheel parts
 - 2. Hub lubrication
 - 3. Tire plys
 - 4. Tire size
 - 5. Tire balance
 - 6. Tire inflation
 - 7. Tire composition
 - B. Slide presentation on studded tire.
 - 1. How made
 - 2. Uses
 - 3. Effects on road surface.
 - 4. Regulations on use.
 - 5. Comparison to snow tires.
 - C. Highway engineer to make presentation on highway resurfacing due to studded tires.

- II. Outside Resource and Community Activities
- Highway engineer.
 - Tire dealer.

Resource and Reference Materials

Publications:

Auto Mechanics Fundamentals,
Martin W. Stockel
Goodheart-Willcox

Audio-Visual:

Auto Mechanics: Wheels and
Tires #53620
U. of Ill, Champaign, Ill.

Community:

Local tire dealer
State highway engineer

Continued and Additional Suggested Learning

ing Continued and Additional Suggested Learning Experiences

C 12. Private ownership must be
 O regarded as a stewardship and Discipline Area In
 N should not enroach upon or Subject Po
 C violate the individual right of others Problem Orientatio
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ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEAR
<p><u>Cognitive:</u> The student will be able to list the ways man has wasted power supplies in the areas of wood, coal, oil and gas.</p> <p><u>Affective:</u> The student will help through work with community action groups to reclaim wasted power supplies and conserve the remaining supplies.</p>	<p>I. Student-Centered in class activity</p> <p>A. The students will study, <u>Man's Struggle To Harness Energy</u></p> <ol style="list-style-type: none"> 1. Early attempts to con 2. Current power develop <p>B. The students will develop a list of ways man can reclaim some of the waste power supplies, and a list of ways man must conserve his remaining power supplies.</p>
<p><u>Skills to be Learned</u> Conservation and reclamation of power supplies. Cooperation.</p>	

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Inwardship and Discipline Area Industrial Arts

h upon or Subject Power Mechanics

idual right of others Problem Orientation Waste of Power Grade 9-12
Supplies.

IVES

SUGGESTED LEARNING EXPERIENCES

I. Student-Centered in class activity

A. The students will study, Man's Struggle To Harness Energy

1. Early attempts to control.
2. Current power developments.

B. The students will develop a list of ways man can reclaim some of the wasted power supplies, and a list of ways man must conserve his remaining power supplies.

II. Outside Resource and Community Activities

A. D.N.R.

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Resource and Reference Materials

Continued and Additional Suggeste

Publications:

Power Technology,

George E. Stephenson

Delmar Publishers, Inc.

Encyclopedias

History Books

Audio-Visual:

Fuels: Their Nature and Use

U. of Ill. Champaign, Ill.

Community:

D.N.R.

ce Materials Continued and Additional Suggested Learning Experiences

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C O N C E P T	<u>1. Energy from the sun, the basic</u> <u>source of all energy, is converted</u> <u>through plant photosynthesis</u> <u>into a form all living things</u> <u>can use for life processes.</u>	Discipline Area <u>Indus</u> Subject <u>Graph</u> Problem Orientation <u>I</u> Type
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	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
ESEA Title III - 59-70-0135-2 Project I-C-E	<p><u>Cognitive:</u> The student will be able to identify in writing how a laser basically operates & how it is used for the composition of printed matter.</p> <p><u>Affective:</u> The student will appreciate the value of the sun's energy for type composition.</p> <p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Type composition 2. Physics of light & energy as it is related to the printing industry. 	<ol style="list-style-type: none"> I. Student-Centered in class activity <ol style="list-style-type: none"> A. The student will write a brief paper on the discovery & history of lasers. B. The student will identify by listing the characteristics of lasers that relate to & from the sun & how it is utilized in the graphic arts industry. C. Small groups of students will report on: <ol style="list-style-type: none"> 1. Industries that use lasers & how they are applied. 2. Different energy's from the sun that are used for the life process. 3. Man's future uses of the laser beams.

from the sun, the basic
 all energy, is converted
 ant photosynthesis
 m all living things
 r life processes.

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Laser Beam & Type Composition Grade 10-12

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
student identify a laser uses & for the printed student the n's composition.	I. Student-Centered in class activity A. The student will write a brief paper on the discovery & history of lasers. B. The student will indentify by listing the characteristics of lasers that relate to & from the sun & how it is utilized in the graphic arts industry. C. Small groups of students will report on: 1. Industries that use lasers & how they are applied. 2. Different energy's from the sun that are used for the life process. 3. Man's future uses of the laser beams.	II. Outside Resource and Community Activities A. Physics teacher to explain lasers and their uses. B. Physicist or nuclear engineer to explain the history & how lasers are used for the Federal government. C. Local printer who has knowledge of lasers to discuss the use of them in the printing industry. D. Visit to a plant that uses lasers for scientific purposes, manufacturing, etc.
earned tion ght t is e printing		

Resource and Reference Materials

Continued and Additional Suggested L

Publications:

Graphic Arts Tech. Found, Inc.
4615 Forbes Ave.
Pittsburgh, Pa 15213
Tech Abstracts

Audio-Visual:

Lasers: An Introduction
#533313 U. Ill.
Champaign, ill.

Community:

Local printer having knowledge
of laser use.

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Continued and Additional Suggested Learning Experiences

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C 2. All living organisms interact
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 E environment, forming an intricate
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 T unit called an ecosystem.

Discipline Area Indust
 Subject Graphic
 Problem Orientation Cl

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
<p><u>Cognitive:</u> The student will clean-up when the clean-up period arrives, and not only complete his own responsibility, but also check overall results.</p> <p><u>Affective:</u> The student will understand that all living systems interact among themselves & their environment, realizing clean-up is a combined effort, not an effort by an individual.</p>	<p>I. Student-Centered in class activity</p> <p>A. Ignore clean-up for one day.</p> <p>B. Have students work next day in messy area with un-cleaned presses & other equipment.</p> <p>C. Evaluate on 3rd day the need for clean-up and relate it to the shop production and environment.</p> <p>D. Organize schedule of duties & responsibilities stressing teamwork.</p> <p>E. Discuss & compare results of clean-up vs. no clean-up, and discuss group interaction and cooperation as it relates to clean-up and everyday existence.</p> <p>F. From this discussion, develop a task list for each individual & a chain of command for each individual to answer to.</p>
<p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Cooperation 2. Responsibility 3. Benefits of clean-up <ol style="list-style-type: none"> 1. Neater work results. 2. Equipment in proper place-easier to find & use. 3. Better operating & producing presses. 4. Safer working atmosphere. 	

ESPA Title III -59-70-0135-2 Project I-C-E

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Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Clean-up

Grade 7-12

GENERAL OBJECTIVES

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orking atmosphere.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Ignore clean-up for one day.
 - B. Have students work next day in messy area with un-cleaned presses & other equipment.
 - C. Evaluate on 3rd day the need for clean-up and relate it to the shop production and environment.
 - D. Organize schedule of duties & responsibilities stressing teamwork.
 - E. Discuss & compare results of clean-up vs. no clean-up, and discuss group interaction and cooperation as it relates to clean-up and everyday existence.
 - F. From this discussion, develop a task list for each individual & a chain of command for each individual to answer to.

- II. Outside Resource and Community Activities
- A. Field trip to local printing industry and view practical applications & advantages of neatness & cleanliness
 - B. Industrial safety commission rep.

Resource and Reference Materials

Publications:

Graphic Arts,
Frederick D. Kagy
Goodheart-Willcox

Audio-Visual:

Community:

Industrial Safety Commission
representative.
Representative of local
printing industry.

Continued and Additional Suggested Learning Activities

1. Have students develop "round robin" of making clean-up more efficient each student an opportunity to have up responsibility.
2. Develop a list on where else a team effort would be beneficial.

Learning Materials	Continued and Additional Suggested Learning Experiences
Robin ent hav tea	<ol style="list-style-type: none"><li data-bbox="403 917 1322 1034">1. Have students develop "round robin" system of making clean-up more efficient and give each student an opportunity to have each clean-up responsibility.<li data-bbox="403 1034 1266 1108">2. Develop a list on where else a team clean-up effort would be beneficial.

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C. 3. Environmental factors are
 O. limiting on the numbers of
 N. organisms living within their
 C. influence, thus, each environment
 E. has a carrying capacity.
 P.
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Discipline Area Industr
 Subject Graphic
 Problem Orientation Crow
Shop

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING E

Cognitive: The student will list & explain 3 physical & 3 psychological effects of environmental crowding & relate them to specific shop areas
Affective: The student will realize that crowding results in adverse physical & psychological conditions result.

Skills to be Learned
 Hazards in environmental crowding.

- | I. Student-Centered in class activity | II. |
|--|-----|
| A. Conduct experiment around following conditions: <ol style="list-style-type: none"> 1. Develop simple task ie, set business card from Calif. job case. 2. Provide only one each of tools req'd. 3. Limit work area to one job case. 4. Limit time (slight) 5. Mass production not allowed. 6. First three done win. B. Discuss personal & physical feelings experienced during experiment. <ol style="list-style-type: none"> 1. Low production 2. Confusion 3. Frustration 4. Irritability 5. Waste 6. Injury (Cont.) | |

Environmental factors are

ing on the numbers of

families living within their

ence, thus, each environment
carrying capacity.

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Crowding in the Grade 7-12
Shop

ORAL OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

The student
explain 3
psycholog-
of environ-
ing & relate
specific shop

The student
that crowd-
in adverse
psychological
result.

Learned
environmental

- I. Student-Centered in class activity
 - A. Conduct experiment around following conditions:
 1. Develop simple task ie, set business card from Calif. job case.
 2. Provide only one each of tools req'd.
 3. Limit work area to one job case.
 4. Limit time (slight)
 5. Mass production not allowed.
 6. First three done win.
 - B. Discuss personal & physical feelings experienced during experiment.
 1. Low production
 2. Confusion
 3. Frustration
 4. Irritability
 5. Waste
 6. Injury

(Cont'd)

- II. Outside Resource and Community Activities
 - A. Sociologist
 - B. Community planning committee rep.
 - C. Real estate developer

Resource and Reference Materials	Continued and Additional Suggested Learning Activities
<p data-bbox="390 931 628 962"><u>Publications:</u></p> <p data-bbox="390 962 709 1059"><u>Graphic Arts,</u> Frederick D. Kagy Goodheart-Willcox</p> <p data-bbox="390 1227 628 1257"><u>Audio-Visual:</u></p> <p data-bbox="390 1257 872 1331">#53525 <u>Man's Effect on the Environment,</u> Univ. of Ill.</p> <p data-bbox="390 1494 572 1524"><u>Community:</u></p> <ol data-bbox="390 1524 834 1659" style="list-style-type: none"> <li data-bbox="390 1524 647 1554">1. Sociologist <li data-bbox="390 1554 778 1629">2. Community planning committee rep. <li data-bbox="390 1629 834 1659">3. Real estate developer 	<p data-bbox="1035 931 1309 962">(Con't from I.)</p> <p data-bbox="1035 962 1797 1036">C. Discuss what would result if a town were managed as in the experiment.</p> <p data-bbox="1035 1036 1797 1066">D. Relate experiment results to concept #1.</p>

Continued and Additional Suggested Learning Experiences

(Con't from I.)

- C. Discuss what would result if a town were planned & managed as in the experiment.
- D. Relate experiment results to concept #3.

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4. An adequate supply of pure
water is essential for life.

Discipline Area _____
Subject _____
Problem Orientation
Treatment _____

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING ACTIVITIES
ESEA Title III - 59-70-0135-2 Project I-C-E	<p><u>Cognitive:</u> The student will be able to name the paper companies having waste water treatment facilities within a 50 mile radius of the school.</p> <p><u>Affective:</u> The student will learn to appreciate the clean water on recreation, fishing, etc.</p> <p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Paper composition. 2. How paper is made. 3. Treatment of water after it is used in a paper mill. 4. Paper selection for specific jobs. 	<ol style="list-style-type: none"> I. Student-Centered in class activity <ol style="list-style-type: none"> A. Lecture & discussion by paper mill rep. "Water treatment facilities in paper companies" <ol style="list-style-type: none"> 1. Machines used in treatment. 2. Chemicals used in treatment. 3. Results achieved. 4. Short & long term plans for water treatment facilities. B. Write a short paper on water treatment on paper mills using lecture notes & related research. C. Question & answer session with E,P.A. rep. to determine what & who is polluting water & what they are doing.

poly of pure

for life.

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Paper Manufacture Grade 7-12
Treatment of Waste Water

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Lecture & discussion by paper mill rep. "Water treatment facilities in paper companies"
 - 1. Machines used in treatment.
 - 2. Chemicals used in treatment.
 - 3. Results achieved.
 - 4. Short & long term plans for water treatment facilities.
 - B. Write a short paper on water treatment on paper mills using lecture notes & related research.
 - C. Question & answer session with E.P.A. rep. to determine what & who is polluting water & what they are doing.

- II. Outside Resource and Community Activities
- A. Field trip to a paper mill.
 - B. Public relations dept. of paper mill.

Resource and Reference Materials	Continued and Additional Sugg
<p><u>Publications:</u> <u>Pulp & Paper,</u> 500 Howard St. San Francisco, Calif. 94105 <u>American Paper Industry,</u> 2570 Devon Ave. Des Plaines, Ill 60018 <u>Chemical Paper Processing,</u> Hale Publishing Co. One Bank St. Stanford, Conn. 06901</p> <p><u>Audio-Visual:</u> <u>Recycling Paper,</u> Riverside Paper Co. Appleton, Wis. <u>Great White Trackaway,</u> Hammermill Paper Co. Erie, Penn.</p> <p><u>Community:</u> Public relations dept. local mill.</p>	<ol style="list-style-type: none"> 1. Develop bulletin board for making effluent treatment 2. Collect water samples from 3. On a local map use colored companies and other industries return it to the river, denote waste treatment qu

als	Continued and Additional Suggested Learning Experiences
Succ rd f men ; fro lore ndus er, at q	<ol style="list-style-type: none">1. Develop bulletin board flow chart showing paper making effluent treatment flow chart.2. Collect water samples from various stages.3. On a local map use colored pins to identify paper companies and other industries which use water & return it to the river, lake, etc. (Have pins denote waste treatment quality)

C 5. An adequate supply of clean air
 O
 N is essential because most organisms
 C
 E depend on oxygen, through
 P
 T respiration, to release the energy
in their food.

Discipline Area Indust
 Subject Graphi
 Problem Orientation Ha

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
ESEA Title III -59-70-0135-2 Project I-C-E	<p><u>Cognitive</u>: The student will be able to list the effects of solvent vapor on the respiratory system.</p> <p><u>Affective</u>: The student will use safety precautions to prevent the breathing of harmful solvent vapors.</p>	<p>I. Student-Centered in class activity</p> <p>1. Student will write a short paper titled: "<u>Is Air Pollution Caused By Cleaning Solvents Used in the Printing Industry?</u>"</p> <p>2. As a group, the students will develop a plan for effective disposal of used cleaning solvents.</p> <p>3. Students will construct a safety poster describing the effects of solvents on the respiratory system.</p>
	<p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Composition of cleaning solvents. 2. Effects of solvent vapor on the respiratory system. 3. Safe disposal of used solvents. 4. Poster construction. 	

y of clean air

most organisms

rough

ase the energy

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Harmful Vapors Grade 7-12

ING. VES | SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
1. Student will write a short paper titled:
"Is Air Pollution Caused By Cleaning Solvents Used in the Printing Industry?"
 2. As a group, the students will develop a plan for effective disposal of used cleaning solvents.
 3. Students will construct a safety poster describing the effects of solvents on the respiratory system.

- II. Outside Resource and Community Activities
1. School chemistry teacher to give demonstration on effects of solvent vapor on materials related to human tissue.
 2. Local doctor to discuss effect of solvent vapor on respiratory system.

Resource and Reference Materials Continued and Additional Suggested

Publications:

Graphic Arts,

Frederic D. Kagy

Goodheart-Willcox

Audio-Visual:

Community:

Local doctor.

Chemistry teacher.

ed
ls Continued and Additional Suggested Learning Experiences

C 6. Natural resources are not equally
 O distributed over the earth or over
 N time and greatly affect the geo-
 C graphic conditions and quality of
 E life.
 P
 T

Discipline Area Industrial
 Subject Graphic
 Problem Orientation Water

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: Given a list of environmental conditions, land, man, employment, recreation that are affected by water shortage, the student will suggest solutions to printing operations that use water & how it can be saved.
Affective: The student will learn to appreciate the limited supply of water.

Skills to be Learned

1. Developing film
 - a. Inspection
 - b. Time & temp.
2. Platemaking with aluminum pre-sensitized plates.
3. Press operations

SUGGESTED LEARNING EXPERIENCES

- | I. Student-Centered in class activity | II. C |
|---|-------|
| A. Student will write a philosophical (dream) on paper on what might happen to his environment if there was no water. | |
| B. Student will write a letter to the Bureau of the Interior to find out what locales have water shortages & what is being done to correct this i.e., Ventura, Calif.--building reservoirs. | |
| C. Student will make a list of different chemicals that are added to water during printing operations & the amount of difficulty encountered in removing same. | |

not equally

ustr: th or over Discipline Area Industrial Arts
phic: the geo- Subject Graphic Arts
ater: uality of Problem Orientation Water Shortage Grade 9-12

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Student will write a philosophical (dream) on paper on what might happen to his environment if there was no water.
 - B. Student will write a letter to the Bureau of the Interior to find out what locales have water shortages & what is being done to correct this ie., Ventura, Calif.--building reservoirs.
 - C. Student will make a list of different chemicals that are added to water during printing operations & the amount of difficulty encountered in removing same.

- II. Outside Resource and Community Activities
- A. Biologist with knowledge of water shortage effects on the total environment.
 - B. Water treatment plant tour.
 - C. Marine biologist to discuss the effects of chemicals on water & their impact on the ecosystem.
 - D. Writing assignment could be an interaction between English and graphic arts..

Resource and Reference Materials	Continued and Additional Suggested Le
<p data-bbox="472 931 712 959"><u>Publications:</u></p> <p data-bbox="472 959 953 1059">U. S. Bureau of Interior Water Related Publications Dept. Of Natural Resources</p> <p data-bbox="472 1222 706 1250"><u>Audio-Visual:</u></p> <p data-bbox="472 1250 997 1322">#32027 <u>Water-Old Problems, New Approaches</u>, Univ. of Ill.</p> <p data-bbox="472 1489 643 1517"><u>Community:</u></p> <ol data-bbox="472 1517 929 1582" style="list-style-type: none"> 1. Local marine biologist 2. Sewage engineer 	<ol data-bbox="1157 941 1829 1041" style="list-style-type: none"> 1. Have students experiment with way process can eliminate or minimize pollution.

Materials | Continued and Additional Suggested Learning Experiences

ways
minimize
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es
III.

1. Have students experiment with ways printing process can eliminate or minimize water use and/or pollution.

C 7. Factors such as facilitating
 O transportation, economic conditions,
 N population growth, and increasing
 C leisure time have a great influence
 E on changes in land use and centers
 P of population density.
 T

Discipline Area Indus
 Subject Graph
 Problem Orientation

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING

Cognitive: The student
 will write an analysis
 paper on current, local
 recycling efforts.
Affective: The student
 will save paper and
 packages for recycling
 instead of sending
 them to the dump.

Skills to be Learned
 1. Methods of recycling
 packages.
 2. Methods of designing
 packages for easier
 recycling.

- I. Student-Centered in class activity
 - A. Local official to speak on local recycling efforts.
 - B. Students will write a brief paper on recycling in your city and make a comparison of these efforts to those of other cities.
 - C. The student will list the effects of non-recycleable material on land use.
 - D. Students will design recycleable packages for:
 - 1. Bottles
 - 2. Meat products
 - 3. Other food products, ect.

such as facilitating

economic conditions,

growth, and increasing

have a great influence
land use and centers
density.

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Packaging for Grade 7-12
Recycling

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

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local

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- I. Student-Centered in class activity
 - A. Local official to speak on local recycling efforts.
 - B. Students will write a brief paper on recycling in your city and make a comparison of these efforts to those of other cities.
 - C. The student will list the effects of non-recycleable material on land use.
 - D. Students will design recycleable packages for:
 - 1. Bottles
 - 2. Meat products
 - 3. Other food products, ect.

- II. Outside Resource and Community Activities
 - Designer from packaging company.

Resource and Reference Materials
Publications:

Continued and Additional S

Audio-Visual:

Community:
Package designer.
Local officials.

Reference Materials | Continued and Additional Suggested Learning Experiences

C 8. Cultural, economic, social,
 O and political factors determine
 N status of man's values and
 C attitudes toward his environment.

Discipline Area Industrial Art
 Subject Graphic Arts
 Problem Orientation Plate-Making

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will list the various metals used in offset printing plates. The student will list the various natural resources used in retal plates and processing materials & their availability.
Affective: The student will appreciate his socio-economic status as related to natural resources, and how some of the resources on his list maintain and improve his standard of living.

Skills to be Learned

1. Plate make-up.
2. Plate processing.
3. Material derivations-- where they come from.
4. Handling of pollutants.
5. Cause-effect thinking.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
 1. Lecture--demonstration-discussion on plates and platemaking.
 - a. Types of plates
 - b. Plate composition
 - c. Plate making and processing.
 2. Discuss and show (from demonstration) types of pollutants from plates.
 - a. Organic oils
 - b. Acidic waters
 - c. Toxic materials
 3. Discuss plate disposal and recycling methods
 4. Relate the flow of events bearing out the fact that resources are needed to promote the flow of communications (via plate produced media) which very directly dictate man's values & attitudes toward his environment.

- II. Outside
 1. Ha
 2. Ha

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Art al factors determine

cs an's valr s and

-Mak toward his environment.

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Plate-Making Grade 11-12

PERI D OUTS COMM 1. Ha lo ta a ma co 2. Ha S O i a	ACTIVITIES	SUGGESTED LEARNING EXPERIENCES	
<p>student various offset The at the vari- sources ates and rials & ty. student his status atural ow ources ntain standard</p>	<p>I. Student-Centered in class activity</p> <ol style="list-style-type: none"> 1. Lecture--demonstration-discussion on plates and platemaking. <ol style="list-style-type: none"> a. Types of plates b. Plate composition c. Plate making and processing. 2. Discuss and show--(from demonstration) types of pollutants from plates. <ol style="list-style-type: none"> a. Organic oils b. Acidic waters c. Toxic materials 3. Discuss plate disposal and recycling methods 4. Relate the flow of events bearing out the fact that resources are needed to promote the flow of communications (via plate produced media) which very directly dictate man's values & attitudes toward his environment. 	<p>II. Outside Resource and Community Activities</p> <ol style="list-style-type: none"> 1. Have speaker from local printing firm talk about what they are doing about plate-making wastes, resource control, etc. 2. Have 3-M representative speak on availability of plate-making materials and other related areas. 	
<p>arned p. sing. ivations-- ne from. ollutants. thinking.</p>			

Resource and Reference Materials	Continued and Additional Suggested Learning E
<p data-bbox="329 931 573 965"><u>Publications:</u></p> <p data-bbox="329 965 872 1032"><u>U.S. Bureau of Mines Progress Report, Aug. 1970</u></p> <p data-bbox="329 1196 776 1294"><u>Audio-Visual:</u> Transparencies on plate-making</p> <p data-bbox="329 1491 776 1559">Local Printing firm rep. 3-M rep.</p>	<p data-bbox="1001 931 1824 1055">1. Have students find other examples of prog and resources affecting societys' way of and study how resource conservation and w materials are handled.</p>

g E e Materials Continued and Additional Suggested Learning Experiences

prog
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Progress 4
1. Have students find other examples of progress
and resources affecting societys' way of life,
and study how resource conservation and waste
materials are handled.

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C 9. Man has the ability to manage,
 O
 N manipulate, and change his
 C
 E environment.
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Discipline Area Industr
 Subject Graphic
 Problem Orientation Nois

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING E	
ESEA Title III - 59-70-0135-2 Pl. ect I-C-E	<p><u>Cognitive:</u> The student will identify the machines and/or areas that cause excessive noise & will select appropriate safety equipment. <u>Affective:</u> The student will appreciate & understand how noise affects the physiological system.</p>	<p>I. Student-Centered in class activity A. Lecture-discussion by the teacher or industrial commission rep. on effective noise control & its effect on working conditions. Factors to consider 1. Frequency 2. Overall level 3. Time distribution of noise exposure 4. Duration of exposure 5. Total work life exposure 6. Susceptibility to noise 7. Noise classification A. Auditory B. Non-auditory B. Research activity--report on noise provisions of the occupational safety & health act. C. How are local plants handling noise pollution?</p>	<p>II.</p>
	<p><u>Skills to be Learned</u> 1. Offset press operation 2. Design for noise control 3. Noise protection</p>		

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Discipline Area Industrial Arts

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Subject Graphic Arts

Problem Orientation Noise Pollution Grade 7-12

GENERAL OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

II. The student
identify the machines
that cause
noise & will
propose appropriate
control
measures.
The student
identify & under-
stand how noise affects
the psychological system.

What is Learned
Press operation
and noise control
protection

I. Student-Centered in class activity
A. Lecture-discussion by
the teacher or industrial
representative on effective
noise control & its
effect on working conditions.
Factors to consider
1. Frequency
2. Overall level
3. Time distribution of
noise exposure
4. Duration of exposure
5. Total work life exposure
6. Susceptibility to noise
7. Noise classification
A. Auditory
B. Non-auditory
B. Research activity--report
on noise provisions of
the occupational safety
& health act.
C. How are local plants
handling noise pollution?

II. Outside Resource and
Community Activities
A. Representative from
a large printing co.
who works in the press
room to discuss noise
control in his area.
B. Psychiatrist--noise
control & its effect
on the psychological
system.
C. Students volunteer to
interview local plant
representatives to
find and/or tape-
record the answers
to in-class activity.
Students will set up
appointments and have
questions approved by
the teachers before
any interview.

Resource and Reference Materials
Publications:

Graphic Arts Tech. Found.,
4615 Forbes Ave.
Pittsburgh, Pa. 14213
Environmental Controls
State: Occupational Safety
& Health Act

Audio -Visual:

#80067 Noise & Health, Univ. of
Ill.
#53497 Noise is Pollution, Too,
Univ. of Ill.

Community:

1. Local safety engineer
2. Industrial Commission rep.

Continued and Additional Suggested Learning

1. Have students design & install noise devices on school machines.

Reference Materials	Continued and Additional Suggested Learning Experiences
<p>arni</p> <p>se</p> <p>Found.,</p> <p>213</p> <p>ontrols</p> <p>l Safety</p> <p>lth, Univ. of</p> <p>llution, Too,</p> <p>gineer</p> <p>mission rep.</p>	<p>1. Have students design & install noise suppression devices on school machines.</p> <p>6</p>

C 10. Short-term economic gains
 O
 N may produce long-term Discipline Area Industrial
 C
 E environmental losses. Subject Graphic Ar
 P
 T _____ Problem Orientation Depleti
 _____ Resourc

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
ESEA Title III - 59-70-0135-2 Project I-C-E	<p><u>Cognitive:</u> The student will list the natural resources used in paper making. The student will list the ways paper manufacturing is depleting our natural resources.</p> <p><u>Affective:</u> The student will learn to appreciate the aesthetic value of natural resources used in paper manufacturing.</p>	<p>I. Student-Centered in class activity</p> <p>A. View film on papermaking.</p> <p>B. List paper companies in your area and the natural resources they use.</p> <p>C. List what each company is doing to replenish the resources they use.</p>	<p>II. Out of class</p> <p>Co</p> <p>1.</p> <p>2.</p> <p>3.</p> <p>4.</p> <p>5.</p> <p>6.</p>
	<p><u>Skills to be Learned</u></p> <p>1. Paper composition</p> <p>2. How to replenish natural resources used in paper manufacturing.</p>		

economic gains

term

Discipline Area Industrial Arts

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Subject Graphic Arts

Problem Orientation Depleting Natural Grade 7-12 Resources.

IVES

SUGGESTED LEARNING EXPERIENCES

IVES	SUGGESTED LEARNING EXPERIENCES
ent	I. Student-Centered in class activity
1.	A. View film on papermaking.
2. student	B. List paper companies in your area and the natural resources they use.
3.	C. List what each company is doing to replenish the resources they use.
4.	II. Outside Resource and Community Activities
5. at	1. Visit local papermill.
6.	2. Visit tree farm.
	3. Visit paper mill waste water treatment plant.
	4. Forester from a paper company.
	5. Public relations dept. of a local paper mill.
	6. D.N.R. rep.

Resource and Reference Materials

Continued and Additional Suggested Learning

Publications:

Printing Views for the Midwest
Printer & Lithographer,

Feb. 1972

Pulp & Paper

500 Howard St.

San Francisco, Calif. 94105

American Paper Industry,

2570 Devon Ave.

Des Plaines, Ill. 60018

Audio-Visual:

Film: Blue Sky Thinking,

Hammermill Paper Co.

Erie, Pa.

Community:

Public relations dept. of
a local paper mill.

Forester from local paper
mill.

earn Materials Continued and Additional Suggested Learning Experiences

Midwest

94105

of

er

C 11. Individual acts, duplicated

O or compounded, produce significant

N environmental alterations over

E time.

P Discipline Area Industrial A

Subject Graphic Arts

Problem Orientation Disposal
Rotogravure

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPER	
ESEA Title III - 59-70-0135-2 Project I-C-E	<p><u>Cognitive:</u> The student will be able to list the ways of cylinder disposal & their environment.</p> <p><u>Affective:</u> The student will be made aware of the tremendous use of resources in cyl. products & the eventual disposition of materials, and the ultimate results.</p>	<p>I. Student-Centered in class activity</p> <p>A. Intaglio printing</p> <p>1. Principles of rotogravure printing.</p> <p>a. Examples of work & plates</p> <p>b. Uses for this process</p> <p>c. Plastic etchings</p> <p>1. Production</p> <p>2. Use</p> <p>B. Have students research the types of metals used in Rotogravure cylinder making and the mining impact of their origin. (More cylinders-more impact)</p> <p>C. Have students research the disposition of dead cylinders (more cylinders-more waste?)</p> <p>D. Possible alternatives (brain storm) Can they be used for colleges, sculptures, abstract design, mobiles, odd furniture, bric a brac.</p>	<p>II. Out</p> <p>Com</p> <p>A.</p> <p>B.</p> <p>C.</p> <p>D.</p>
	<p><u>skills to be Learned</u></p> <p>1. Plastic etchings</p> <p>2. Printing from an engraved surface</p>		

uplicated

Significant Discipline Area Industrial Arts

ns over Subject Graphic Arts

Problem Orientation Disposal of Grade 10-12
Rotogravure Plates

SUGGESTED LEARNING EXPERIENCES

I. Student-Centered in class activity

A. Intaglio printing

1. Principles of

rotogravure printing.

a. Examples of work & plates

b. Uses for this process

c. Plastic etchings

1. Production

2. Use

B. Have students research the types of metals used in Rotogravure cylinder making and the mining impact of their origin.

(More cylinders-more impact)

C. Have students research the disposition of dead cylinders (more cylinders-more waste?)

D. Possible alternatives (brain storm) Can they be used for colleges, sculptures, abstract design, mobiles, odd furniture, bric a brac.

II. Outside Resource and Community Activities

A. Tour a local gravure printing plant.

B. Tour an engraving plant.

C. Rotogravure specialist

1. Metals used

2. Cylinder usage & disposal

D. Engraver

1. Types of engraving

Resource and Reference Materials	Continued and Additional Suggested
<p data-bbox="418 884 664 918"><u>Publications:</u></p> <p data-bbox="418 918 800 952"><u>Graphic Arts Monthly</u></p> <p data-bbox="418 1176 664 1209"><u>Audio-Visual:</u></p> <p data-bbox="418 1209 991 1321">teacher made slide series and/or trans. visualizing intaglio & rotogravure process.</p> <p data-bbox="418 1444 600 1478"><u>Community:</u></p> <p data-bbox="418 1478 700 1512">Local engravure</p> <p data-bbox="418 1512 955 1545">Local rotogravure specialist.</p>	<p data-bbox="1110 884 1692 963">1. Develop a collection of roto 2. Develop a cost analysis of a</p>

Continued and Additional Suggested Learning Experiences

1. Develop a collection of roto plates & examples.
2. Develop a cost analysis of a roto plate.

C 12. Private ownership must be
 O regarded as a stewardship and should
 N not encroach upon or violate the
 C individual right of others.
 E
 P
 T

Discipline Area Industrial
 Subject Graphic Ar
 Problem Orientation Owners
Industry vs. Rig

BEHAVIORAL OBJECTIVES

Cognitive: The student will list 10 instances where taking all liberties because a person is an owner of a publication may have negative effects.
Affective: The student will realize that ownership of a printing establishment does not overrule rights and feelings of others.

Skills to be Learned

1. Concepts behind "free speech" cliché.
2. "Unwritten" rights of others.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
 - A. Openly-lead discussion--
 1. Question: What is the difference between reporting and editorializing?
 - a. What are the good and bad points of the two types of writing?
 - B. Relate-through discussion: Just because a person is the owner of a publication, he doesn't have the right to write anything he wishes, just as a person or persons doesn't have the right to do anything he wishes with his property, materials, wastes, etc.
 - C. Role-play situation of editor or publication owner vs. Other journalist
 Community citizen
 Judge, Lawyer

ESEA Title III - 59-70-0135-2 Project I-C-E

must be

Discipline Area Industrial Arts

Subject Graphic Arts

Problem Orientation Ownership of Grade 7-12
Industry vs. Rights of Ownership

SUGGESTED LEARNING EXPERIENCES:

- | | |
|--|---|
| <p>I. Student-Centered in class activity</p> <p>A. Openly-lead discussion--</p> <p>1. Question: What is the difference between reporting and editorializing?</p> <p>a. What are the good and bad points of the two types of writing?</p> <p>B. Relate-through discussion: Just because a person is the owner of a publication, he doesn't have the right to write anything he wishes, just as a person or persons doesn't have the right to do anything he wishes with his property, materials, wastes, etc.</p> <p>C. Role-play situation of editor or publication owner vs. Other journalist
 Community citizen
 Judge, Lawyer</p> | <p>II. Outside Resource and Community Activities
 Local journalist or english (journalism) teacher.</p> |
|--|---|

Resource and Reference Materials
Publications:

Continued and Additonal als

1. Develop list of all "ships rights" defini
2. Study further into t
check" from doing wh

Audio-Visual:

Community:
Local journalist

als Continued and Aditonal Suggested Learning Experiences

1. Develop list of all possible areas where "ownership rights" definitely harm others.
2. Study further into the ways owners are "held in check" from doing what they want in industry.

1. Energy from the sun, the basic source of all energy, is converted through plant photosynthesis into a form all living things can use for life processed.

Discipline Area Ind
 Subject Pla
 Problem Orientation nc

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING

Cognitive: The student will produce a flow chart of 3 types of plastics showing sun energy to be the basic source.

Affective: The student will realize the importance of the sun energy to plastics.

Skills to be Learned

1. Types of plastics
2. Flow charts
3. Researching

- I. Student-Centered in class activity
 - A. Have on hand a number of examples of different types of plastics, with type written on.
 - B. What do these plastics have in common?
 - C. Divide students into small groups & have them back trace their particular type. (see origin of plastics chart) attach.
 - D. With class discussion emphasize importance of "sun energy" as it relates to life processes.
 1. What role does the sun play in the origin of plastics?
 2. Would it be possible to have plastics without the sun? Why?
 3. What effects does the sun have in plastics?

ESEA Title III - 59-70-0135-2 Project I-C-E

n, the basic

is converted Discipline Area Industrial Arts

ynthesis into Subject Plastics

ngs can use Problem Orientation Origin of Plastics Grade 9-12

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Have on hand a number of examples of different types of plastics, with type written on.
 - B. What do these plastics have in common?
 - C. Divide students into small groups & have them back trace their particular type. (see origin of plastics chart) attach.
 - D. With class discussion emphasize importance of "sun energy" as it relates to life processes.
 - 1. What role does the sun play in the origin of plastics?
 - 2. Would it be possible to have plastics without the sun? Why?
 - 3. What effects does the sun have in plastics?

- II. Outside Resource and Community Activities
- 1. School chemistry teacher.
 - 2. Representative from plastics industry.

Resource and Reference Materials

Continued and Additional Suggest

Publications:

Woodworker Annual, Volume 73,
V. J. Taylor, Drake Publishers,
440 Park Ave. South
New York, N.Y. 10016

Plastics Technology, Robert
S. Swanson, McKnight & McKnight
Bloomington, Ill.

General Plastics Proj & Proc.

Raymond Cherry, McKnight &
McKnight, Bloomington, Ill.

Audio-Visual:

#51778 Origin & Synthesis of Plastic
Materials, Univ. Of Ill. Champaign,
Ill.

Community:

1. Chemistry instructor
2. Rep. plastic industry

1. Develop method of simpl
burning - smelling-scrap
of plastics
PG.70 Woodworker Annual

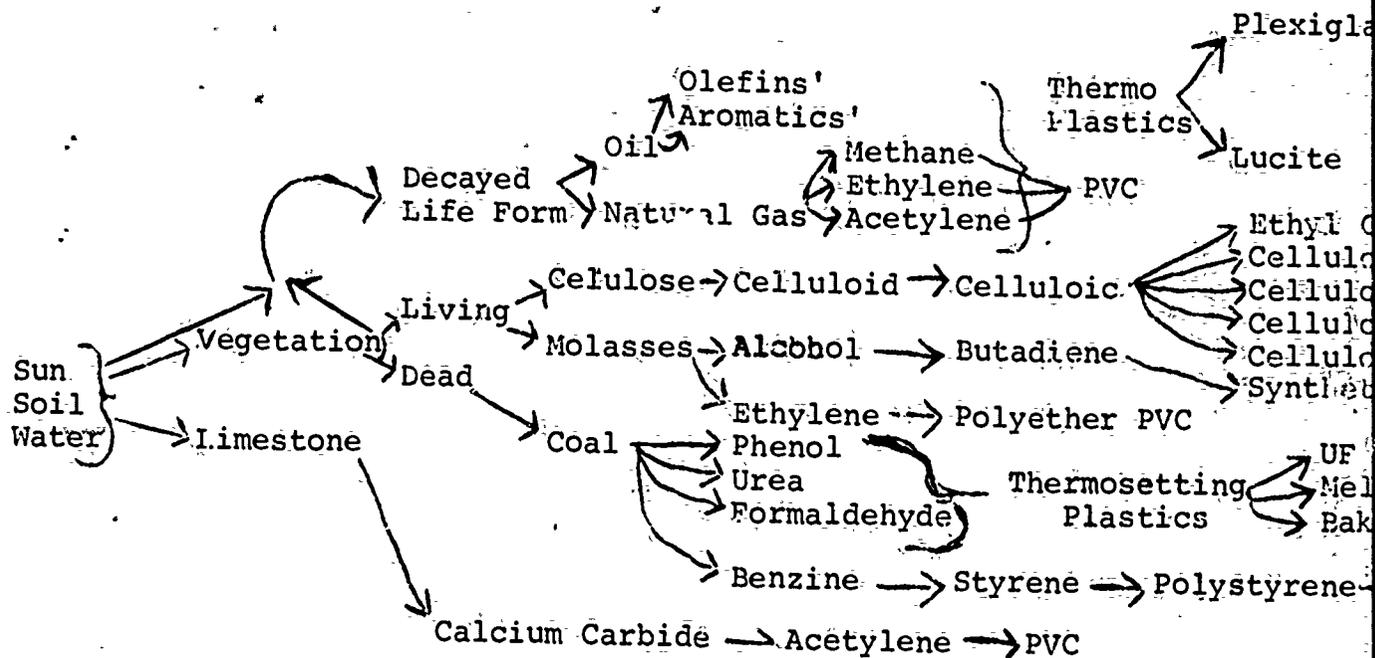
als Continued and Additional Suggested Learning Experiences

1. Develop method of simple tests composed of burning - smelling-scratching to identify types of plastics

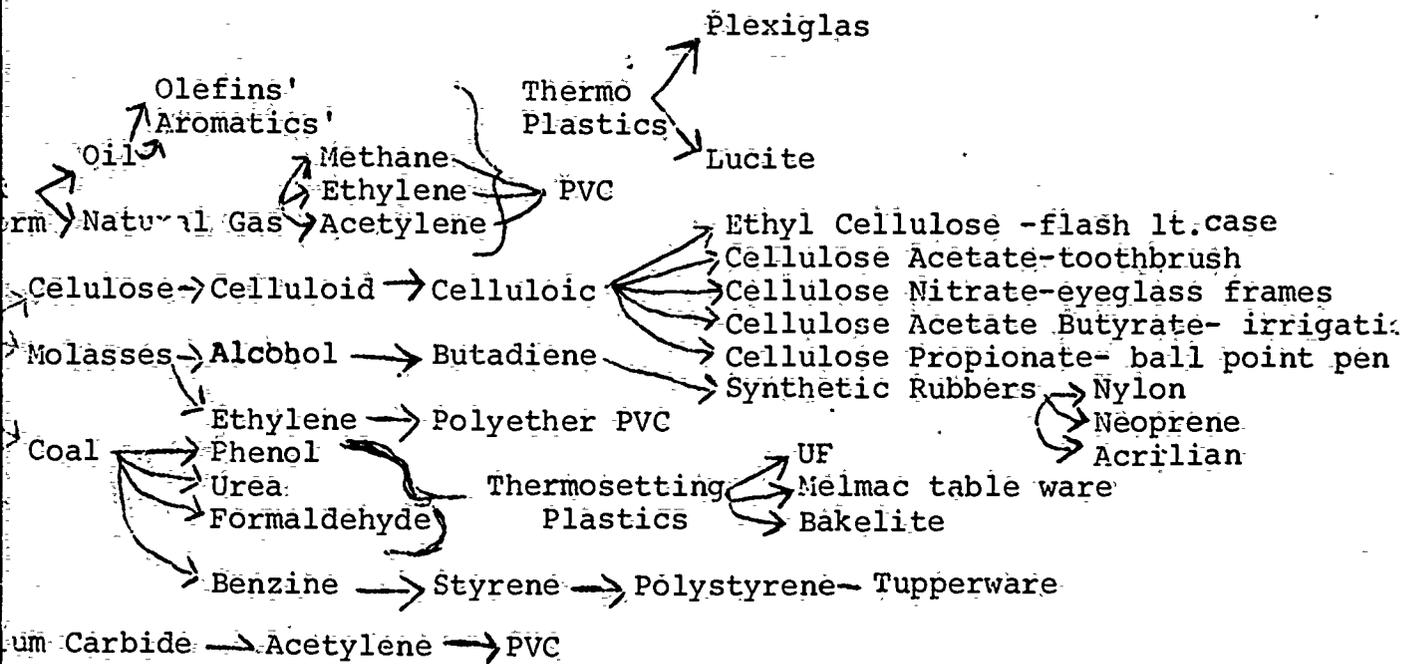
PG.70 Woodworker Annual Vol 73

plastic
aign,

ORIGIN OF PLASTICS



ORIGIN OF PLASTICS



C O N C E P T	<u>2. All living organisms interact</u> <u>among themselves and their</u> <u>environment, forming an intricate</u> <u>unit called an ecosystem.</u>	Discipline Ar Subject Problem Orient
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ESIA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will be able to define polymerization. The student will be able to diagram the polymerization process.
Affective: The student will be able to visualize how people working together to build a community can be compared to polymerization.

Skills to be Learned
The process of polymerization.
The working of an ecosystem.

SUGGESTED

- I. Student-Centered in class activity
- A. Define polymerization "poly"-many "Meros"-parts
- B. Diagram how many parts of monomer link together to form new material
- C. Relate polymerization an ecosystem.
 - 1. Compare individual molecules to individuals.
 - 2. Compare linking of molecules to people working together, ecosystem, in an system.
 - 3. Compare links to which affect other or job fields, related industries.

organisms interact

and their

Discipline Area Industrial Arts

ing an intricate

Subject Plastics

system.

Problem Orientation Polymerization Grade 9-12

IVES	SUGGESTED LEARNING EXPERIENCES	
ize red rization. system.	I. Student-Centered in class activity A. Define polymerization "Poly"-many "Meros"-parts B. Diagram how many parts of monomer link together to form new material. C. Relate polymerization to an ecosystem. 1. Compare individual molecules to individual people. 2. Compare linking of molecules to people working together, in ecosystem, in an economic system. 3. Compare links to careers which affect other careers or job fields, related industries.	II. Outside Resource and Community Activities Chemistry teacher. Counselor-Job opportunities

Resource and Reference Materials

Continued and Additional Suggested

Publications:

Cope's Plastics Book,

Dwight Cope

Goodheart-Willcox

General Plastics,

Raymond Cherry

McKnight & McKnight

Job Opportunities Handbook

Audio-Visual:

Chemistry chart showing
polymerization.

Community:

Chemistry teacher

Continued and Additional Suggested Learning Experiences

CONCEPT 3. Environmental factors are
limiting on the numbers of
organisms living within their
influence, thus, each environment
has a carrying capacity.

Discipline Area Indu
 Subject Plas
 Problem Orientation P

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING

ESEA Title III -59-70-0135-2 Project I-C-E

Cognitive: The student will develop a chart listing the methods of joining plastics, examples of these methods, and breaking points of the joints.
Affective: The student will realize that each joining method or system has a definite load limit that it can handle before failing.

Skills to be Learned

1. Types and methods of plastic joinery
2. Joint testing and evaluation
3. Chart making

- I. Student-Centered in class activity
 - A. Demonstrate methods of joining plastics. (Show, tell, & do)
 1. Cohesion
 - a. Solvent cementing
 - b. Thermal welding
 2. Adhesion
 - a. Adhesive (different from either of materials)
 3. Mechanical linkage
 - a. Screws
 - b. Rivets
 - c. Bolts & nuts
 - d. Spring clips
 - B. Using equipment available, test to determine how much of a load each joint will carry before failing.
 - C. By brainstorming, relate carrying capacity of joints to carrying capacity of examples in our environment
 1. Street--can handle only so much before problems (Con't)

actors are _____

ndu bers of _____

las hin their _____

n h environment
P city.

Discipline Area Industrial Arts

Subject Plastics

Problem Orientation Fastening of Plastics Grade 10-12

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Demonstrate methods of joining plastics. (Show, tell, & do)
 - 1. Cohesion
 - a. Solvent cementing
 - b. Thermal welding
 - 2. Adhesion
 - a. Adhesive (different from either of materials)
 - 3. Mechanical linkage
 - a. Screws
 - b. Rivets
 - c. Bolts & nuts
 - d. Spring clips
 - B. Using equipment available, test to determine how much of a load each joint will carry before failing.
 - C. By brainstorming, relate carrying capacity of joints to carrying capacity of examples in our environment.
 - 1. Street--can handle only so much before problems (Con't)

- II. Outside Resource and Community Activities
- A. Chemistry teacher
 - B. Representative of plastics industry (ie, DuPont, etc.)
 - C. Various local people discussing area job possibilities.

Resource and Reference Materials	Continued and Additional Suggested Le
<p><u>Publications:</u></p> <ol style="list-style-type: none"> 1. <u>Plastics Technology</u>, Robert S. Swanson McKnight & McKnight 2. <u>General Plastics</u>, Raymond Cherry McKnight & McKnight <p><u>Audio-Visual:</u></p> <ol style="list-style-type: none"> 1. Actual Samples of joints 2. Transparency series <p><u>Community:</u></p> <p>Plastics Industry Rep. (ie, DePort)</p> <p>A. Schwichtenberg- Polyfoam Lester Frarie, Minn.</p>	<p>(Con't from I.) occur.</p> <ol style="list-style-type: none"> 2. Water main-- (same) 3. Job opportunities--load limit <ol style="list-style-type: none"> 1. Create larger chart for class <ol style="list-style-type: none"> a. Types of joints b. Methods of making them c. Breaking points 2. Have students find samples of types of joints and use these chart (#1) to produce multi-me 3. Have students perform same typ other materials used in indust present their results. 4. Prepare list of standard faste for plastics as well as other

Continued and Additional Suggested Learning Experiences

(Con't from I.)

occur.

2. Water main--(same)
3. Job opportunities--load limit in local community.
1. Create larger chart for class room use of
 - a. Types of joints
 - b. Methods of making them
 - c. Breaking points
2. Have students find samples of different types of joints and use these to supplement chart (#1) to produce multi-media display
3. Have students perform same type of research with other materials used in industrial arts and present their results.
4. Prepare list of standard fasteners that are used for plastics as well as other materials.

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4 An adequate supply of pure
water is essential for life.

Discipline Area Industrial
Subject Plastics
Problem Orientation Mold Re

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will be able to list and demonstrate the various methods of mold release.
Affective: The student will select the simplest, yet best method, of mold release for the item he is producing.

Skills to be Learned
Methods of mold release.
Methods to reclaim water used in the mold release process.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Methods of mold release
 - 1. Water
 - 2. Air
 - 3. Ejection
 - B. In the study of water mold release, the student will list the pollutants added to water by this process.
 - 1. Heat
 - 2. Polyvinyl alcohol
 - 3. Plastic particles.
 - C. Students will develop plan to reclaim water used in the mold release process.
 - 1. Distillation
 - 2. Secondary treatment
 - D. Students will present debate or defend "their plan" to the class or teacher.

II. Out of class activity

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Re...
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Discipline Area Industrial Arts

Subject Plastics

Problem Orientation Mold Release Grade 9-12

SUGGESTED LEARNING EXPERIENCES

I. Centered in class
Methods of mold release
Water
Injection
In the study of water mold release, the student will identify the pollutants added to water by this process. Students will develop a plan to reclaim water used in the mold release process. Students will present their plan or defend "their plan" to the class or teacher.

II. Outside Resource and Community Activities
Rep. from an area plant that does plastic molding.
Engineer from local sewage treatment plant.

Resource and Reference Materials	Continued and Additio
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<u>Publications:</u>	
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<u>Fiber Glass Projects and Procedures</u>	
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Gerald L. Steele

McKnight & McKnight

Audio-Visual:

Teacher developed slides.

Community:

Rep. from an area plastic
molding plant.

Engineer from local sewage treat-
ment plant.

io cials | Continued and Additional Suggested Learning Experiences

cedures

treat-

C 5An adequate supply of clean air is

O
N essential because most organisms

Discipline Area Industrial

C
E depend on oxygen, through respiration, Subject

Plastics

P
T to release the energy in their food.

Problem Orientation Plastic Treatment

ESEA Title III - 59-70-0135-2 Project I-C-1

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING EXP

Cognitive: Given a specific air cleaning task, the student will be able to select a "plastic" that best suits the job & explain how it will clean the air.
Affective: The student will understand the qualities a "plastic" must possess to remove particulants from dirty air.

- Skills to be Learned
1. Filtration principles
 2. Uses of plastic products for air filtration
 3. Limitations of plastics & filtration
 4. Research techniques

- I. Student-Centered in class activity
 - A. Bean bag discussion: How are plastics used to purify air--give a specific example
 1. Furnace filters
 2. Vacuum cleaner filter
 3. Cigarette filters
 4. Respirator masks
 5. Air filter on car
 6. Glass PAC mufflers
 7. Exhaust fan hoods
 - B. Research the above applications & discover what properties must the plastic fibers have?
 - C. Develop charts using the researched properties. Each group assigned or volunteer to research one type of filter.
 - D. Given a specific air cleaning task select from chart or research & select a plastic that would best suit the job. (Con't)

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of clean air is

most organisms

Discipline Area Industrial Arts

through respiration, Subject

Plastics

ergy in their food.

Problem Orientation Plastic and Air Grade 9-12
Treatment

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
Specific to at e y les products n stics	<p>I. Student-Centered in class activity</p> <p>A. Bean bag discussion: How are plastics used to purify air--give a specific example</p> <ol style="list-style-type: none">1. Furnace filters2. Vacuum cleaner filter3. Cigarette filters4. Respirator masks5. Air filter on car6. Glass PAC mufflers7. Exhaust fan hoods <p>B. Research the above applications & discover what properties must the plastic fibers have?</p> <p>C. Develop charts using the researched properties. Each group assigned or volunteer to research one type of filter.</p> <p>D. Given a specific air cleaning task select from chart or research & select a plastic that would best suit the job. (Con't)</p>	<p>II. Outside Resource and Community Activities</p> <p>A. Selected students will interview local industries to discover what particular filtration (both liquid & air) devices they use, and obtain examples where possible. Sample questions for the interview:</p> <ol style="list-style-type: none">1. What particular air pollution do you have at this plant?2. How are you controlling this problem?3. How successful have your efforts been? <p>B. Air filtration specialist (heat, & vent, contractor)</p>

Resource and Reference Materials

Publications:

Literature from various filter manufacturers.

Audio-Visual:

Teacher developed transparency set.

Community:

I. Heat & vent contractor

Continued and Additional Suggested Le

(Con't from I.)

E. Presentation by "air filtration plastics can clean the air."

1. Develop a collection of plastic
2. The students will organize a clean filter drive, to promote better

Results:

A. Efficiency increased

B. Shorter burn time-less air po

C. Cost reduction in operation.

3. Develop test to measure amount of particulant removed by various "devices"

Le ued and Additional Suggested Learning Experiences

t from I.)
presentation by "air filtration" expert how
astics can clean the air.
develop a collection of plastic filtration media.
he students will organize a clean your furnace
filter drive, to promote better furnace operation.

esults:

- . Efficiency increased
 - . Shorter burn time-less air pollution.
 - . Cost reduction in operation.
- develop test to measure amount or % of
articulant removed by various "air filtering
devices"

C 6. Natural resources are not equally
 O
 N distributed over the earth or over
 C
 E time and greatly affect the geographic
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 T conditions and quality of life.

Discipline Area Indu
 Subject Plas
 Problem Orientation
 Serving as Co

	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
ESEA Title III - 59-70-0135-2 Project I-C-E	<p><u>Cognitive:</u> The student will list 10 products which are now made of plastic (previously made of another material) and project 4 possible reasons why the change was made.</p> <p><u>Affective:</u> The student will realize that changing the material a product is made of also changes in many instances, the geographic area in which it is produced.</p> <p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Types & uses of plastic products. 2. Composition of plastics. 3. Geographic locations of natural resources 4. Geographic locations of raw materials used in the manufacture of plastics. 	<ol style="list-style-type: none"> I. Student-Centered in class activity <ol style="list-style-type: none"> A. Brainstorm list of products now made of plastic formerly made of other natural resources. <ol style="list-style-type: none"> 1. Wood--counter & table tops, paneling, bldg. exteriors 2. Metal--Desks, auto bodies engine & auto parts, window wash frames 3. Glass--plexiglass, dishes containers. B. Develop flow chart, & compare geog. locations of plastic raw products and natural resources. C. Research plant locations producing various plastic products, & map them in contrast to locations of plastic raw materials D. Study results of work in portion C. E. Relate results and conclusions of study (part D) to (Con't)

sources are not equally

er the earth or over

Discipline Area Industrial Arts

ly affect the geographic

Subject

Plastics

quality of life.

Problem Orientation Plastic Products Grade 8-12
Serving as Conservers of Natural Resources

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

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- I. Student-Centered in class activity
- A. Brainstorm list of products now made of plastic formerly made of other natural resources.
 1. Wood--counter & table tops, paneling, bldg. exteriors
 2. Metal--Desks, auto bodies engine & auto, parts, window wash frames
 3. Glass--plexiglass, dishes, containers.
 - B. Develop flow chart, & compare geog. locations of plastic raw products and natural resources.
 - C. Research plant locations producing various plastic products, & map them in contrast to locations of plastic raw materials
 - D. Study results of work in portion C.
 - E. Relate results and conclusions of study (part D) to
- (Con't)

- II. Outside Resource and Community Activities
- A. Representative of local plastics manufacturing industry.
 - B. Chamber of Commerce.

Resource and Reference Materials

Publications:

Wisconsin Geography

Dept. of Public Instruction
126 Langlon St.
Madison, Wis.

Audio-Visual:

Film Basic Elements of Production
#60196, U. of Ill. Champaign, Ill.

Community:

1. Plastics manufacturing
personnel (if possible)
2. Chamber of Commerce
individual to explain
in-coming or outgoing
industries and their
effect on the community
and quality of life.

Continued and Additional Suggested Learning

1. Have students find information on a ghost-town, and try to retrace the steps which led to it's becoming a ghost town.
 - a. Commercial factors
 - b. Accessibility
 - c. Natural resources, etc.

Continued and Additional Suggested Learning Experiences

1. Have students find information on a given ghost-town, and try to retrace the steps which led to it's becoming a ghost town.
 - a. Commercial factors
 - b. Accessibility
 - c. Natural resources, etc.

7. Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influence on changes in land use and centers of population density.

Discipline Area
Subject
Problem Orientation
Use

ESEA Title III -59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING ACTIVITIES
<p><u>Cognitive:</u> The student will be able to list ten plastic products used in leisure time vehicles.</p> <p><u>Affective:</u> The student will understand how plastic has changed the leisure time vehicle industry.</p>	<p>I. Student-Centered in class activity</p> <p>A. Students will develop a list of plastic products used in leisure time vehicles.</p> <ol style="list-style-type: none"> 1. Snowmobile bodies 2. Boats 3. ALT vehicles 4. Dune buggy
<p><u>Skills to be Learned</u></p> <p>Uses of plastic in transportation.</p> <p>How the plastic industry has changed the economy.</p>	<p>B. Students will study those items listed which are produced in their area and how they have changed population and economic conditions.</p>

ors such as facilitating

ation, economic conditions,

Discipline Area Industrial Arts

on growth, and increased

Subject Plastics

time have a great influence
Use es in land use and centers
ation density.

Problem Orientation How Plastic is Grade 9-12
Used in Leisure Time Vehicles

GENERAL OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

The student
e to list
c products
sure time

- I. Student-Centered in class activity
- A. Students will develop a list of plastic products used in leisure time vehicles.
1. Snowmobile bodies
 2. Boats
 3. ALT vehicles
 4. Dune buggy
- B. Students will study those items listed which are produced in their area and how they have changed population and economic conditions.

- II. Outside Resource and Community Activities
- A. Rep. from area plant which produces plastic products used in leisure time vehicles.
- B. Students interview local businessmen in companies recently affected.
- C. Students contact local and nearby Chambers of Commerce for population & economic changes per products developed.

The student
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dustry.

be Learned
astic in
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astic industry.
the economy.

Resource and Reference Materials Continued and Additional Suggested Learning Ex

Publications:

Fiber Glass Projects and
Procedures,

Gerald L. Steele
McKnight & McKnight
Plastics Technology,
Robert S. Swanson
McKnight & McKnight

Audio-Visual:

Plastics and Fiberglass:
University of Ill.
Champaign, Ill.

Community:

Rep. from area plastics plant.

Ex als Continued and Additional Suggested Learning Experiences

nt.

C 8. Cultural, economic, social,
 O
 N and political factors determine
 C
 E status of man's values and attitudes
 P
 T toward his environment.

Discipline Area Indus

Subject Plas

Problem Orientation p

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

SUGGESTED LEARNING

Cognitive: Given a sample mixture of furniture parts made of wood and plastic, the student will be able to separate the plastic parts from the wood parts.
Affective: The student will realize the place of plastic in the furniture industry and change his attitudes to accept them.

Skills to be Learned
 How to distinguish between furniture parts made of wood and plastic.
 How plastic is used in furniture.
 How the use of plastic affects the cost of furniture.

- I. Student-Centered in class activity
 - A. Students will develop a list of ways plastic is used in furniture.
 1. Tops
 2. Finish
 3. Drawers
 4. Doors
 5. Legs
 6. Applique.
 - B. From the list developed in A, students will develop a list of reasons for the use of plastic in furniture and individual furniture parts.
 1. Cost
 2. Durability
 3. Appearance
 - C. Students will be shown examples of identical furniture parts made of wood or plastic. Students discuss: (Con't)

economic, social,

factors determine

Discipline Area Industrial Arts

's values and attitudes.

Subject Plastics

Environment.

Problem Orientation Plastics in Grade 9-12
Furniture

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
en a of made of c, the able to astic wood parts. student e place of furni- nd change o accept	<p>I. Student-Centered in class activity</p> <p>A. Students will develop a list of ways plastic is used in furniture.</p> <ol style="list-style-type: none">1. Tops2. Finish3. Drawers4. Doors5. Legs6. Applique. <p>B. From the list developed in A, students will develop a list of reasons for the use of plastic in furniture and individual furniture parts.</p> <ol style="list-style-type: none">1. Cost2. Durability3. Appearance <p>C. Students will be shown examples of identical furniture parts made of wood or plastic. Students discuss: (Con't)</p>	<p>II. Outside Resource and Community Activities</p> <p>Rep. from area plastic moldings plant.</p> <p>Local furniture dealer.</p>
arned ish re parts d plastic. used in plastic t of		

Resource and Reference Materials	Continued and Additional Suggested Learning
<p><u>Publications:</u> <u>Advanced Woodworking and Furniture Making,</u> John I. Feirer & Gilbert Hutchings Chas. A. Bennett Co. <u>Fiber Glass Projects and Procedures,</u> Gerald L. Steele McKnight & McKnight</p> <p><u>Audio-Visual:</u> <u>Plastics: Industrial Processes and Products, #86000</u> U. of Ill., Champaign, Ill</p> <p><u>Community:</u> Rep. from area plastic molding plant. Local furniture dealer.</p>	<p>(Con't from I.)</p> <ol style="list-style-type: none"> 1. How can you recognize plastic parts marks, etc.) 2. How does the use of plastic change furniture? <p>D. Students will be given several furniture and asked to identify the material of.</p>

Reference Materials

Continued and Additional Suggested Learning Experiences

ing and
Gilbert Hutchings
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es and

- (Con't from I.)
1. How can you recognize plastic parts? (By mold marks, etc.)
 2. How does the use of plastic change our values of furniture?
 - D. Students will be given several furniture parts and asked to identify the material they are made of.

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g. Man has the ability to manage,
manipulate, and change his
environment.

Discipline Area Industrial Art
Subject Plastics
Problem Orientation Plastic Identification &

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p><u>Cognitive:</u> The student will test 4 samples & correctly identify them; recycle the thermoplastics, suggest at least 2 2nd lives for the thermosets & explain how his actions relate to his environment.</p> <p><u>Affective:</u> The student will realize that the cost of injection & thermoforming projects can be held down by the addition of recycleable plastics.</p>	<p>I. Student-Centered in class activity</p> <p>A. Each student will bring a sample of three different disposable plastic containers & if possible discover who manufactures them.</p> <p>B. Test the samples in class to determine if the plastic is:</p> <ol style="list-style-type: none"> 1. Thermoplastic (Recycleable) 2. Thermoset (Non-Recycleable) 3. Identify-specific type. <p>C. Since the thermoplastic is recycleable it presents no problem.</p> <p>D. Thermosetting plastic does present a problem</p> <ol style="list-style-type: none"> 1. Why does the manufacturer use this type? Write & ask. (Con't) 	<p>II. Outside</p> <p>Communit</p> <ol style="list-style-type: none"> 1. Art 2. Recycle <p>plastic discovery culture</p>
<p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Testing plastics 2. Recycling procedure 3. Letter writing 4. Brainstorming 		

ESEA Title III -59-70-0135-2 Project I-C-E

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Art e, and change his

Discipline Area Industrial Arts

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Subject Plastics

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Problem Orientation Plastic Ident- Grade 7-12
ification & Recycling

ITEM

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

the student
samples &
identify them;
thermoplastics,
least 2-2nd, lives
mosets & explain
ons relate to
ent.

I. Student centered in class activity

II. Outside Resource and Community Activities

A. Each student will bring a sample of three different disposable plastic containers & if possible discover who manufactures them.

1. Art teacher
2. Representative from plastics industry to discuss their particular recycling efforts.

B. Test the samples in class to determine if the plastic is:

1. Thermoplastic (Recycleable)
2. Thermoset (Non-Recycleable)
3. Identify-specific type.

will realize
of injection
ing projects
down by the
recycleable

C. Since the thermoplastic is recycleable it presents no problem.

D. Thermosetting plastic does present a problem

1. Why does the manufacturer use this type? Write & ask.

(Con't)

Learned
lastics
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ming

Resource and Reference Materials	Continued and Additional Suggested Learning
<p><u>Publications:</u> <u>Woodworkers Annual Vol. 73,</u> <u>V.J. Taylor Drake Pub. Ltd.</u> <u>General Plastics, Raymond</u> <u>Cherry, McKnight &</u> <u>McKnight, Bloomington, ILL.</u></p> <p><u>Audio-Visual:</u> Teacher/student developed charts-displays-transparencies</p>	<p>(Con't from I.)</p> <p>2. Brainstorm alternative 2nd lives.</p> <p>A. Birdhouses</p> <p>B. Art forms</p> <p>C. Household uses</p> <p>E. In groups define specific reasons why we be concerned about the problem presented. (Results should relate directly to concept)</p> <p>F. Recycle thermoplastics in shop procedure</p> <p>Test design--see attached sheet</p>

Materials	Continued and Additional Suggested Learning Experiences
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(Con't from I.)

73,
Ltd.
nd

2. Brainstorm alternative 2nd lives.

A. Birdhouses

B. Art forms

C. Household uses

ILL.

E. In groups define specific reasons why we should be concerned about the problem presented in D-2?
(Results should relate directly to concept #9)

F. Recycle thermoplastics in shop procedure

ed
re
encies

Test design--see attached sheet

FIELD TESTED
TEST DESIGN

From Sample Cut
Off Thin Sliver

If The Result is Powdery
Chips it is a Thermosetting
Plastic

Attempt to Light
The Sliver

If the Smell is Phenolic
& The Sliver Turns Dark
Brown/Black=Phenoformaldehyde

If The Smell Is Fishy &
The Sliver Is White Or
Brightly Colored=Urea/
Melamine Formaldehyde

If The Noise Is Dull
Place The Sliver In Soapy
Water

Single Smell Of
Styrene=Polystyrene

Floats It Is A
Polyolefin
Type

Sinks, Burn A Small
Piece & Observe The
Flame & Ease Of Burning

Scratch With
Fingernail

Burns With A Yellow
Flame-Blow Out the Flame
& Smell

Burns With
Note Color
Ignited

FIELD TESTED
TEST DESIGN

From Sample Cut
Off Thin Sliver

is Powdery
Thermosetting

If The Sliver Cut Smoothly
It Is a Thermoplastic (To
Confirm, Place a Piece Of
Hot Metal To The Sliver It
Should Melt Or Go Soft)

is Phenolic
Turns Dark
Phenoformalde-

If The Smell Is Fishy &
The Sliver Is White Or
Brightly Colored=Urea/
Melamine Formaldehyde

Drop The Sliver on To A
Hard Surface From A Height
Of About 2½ To 3'.

If the Noise Is Metallic
Then It Is Styrene Base.
Burn The Sliver & Smell
The Smoke.

If The Noise Is Dull
Place The Sliver In Soapy
Water

Single Smell Of
Styrene=Polysty-
rene

Bitter Smell As Well
As Styrene With A
Smell of Rubber=
ABS Co. Polymer

Sinks, Burn A Small
Piece & Observe The
Flame & Ease Of Burning

Burns With A Yellow
Flame-Blow Out the Flame
& Smell

Burns With Difficulty
Note Color Of Flame While
Ignited

(Continued)

↓
If it Will Not
Scratch = Polypropylene

↓
Scratches A Little =
H.D. Polyethylene

↓
Scratches Easily =
C. D. Polyethylene

↓
A Smell Like Methylated
Spirits = Acrylic

↓
A Smell Of Burning Paper =
Cellulose Acetate

↓
Acidic Plus A Smell Of
Rancid Butter = Cellulose
Acetate Butyrate

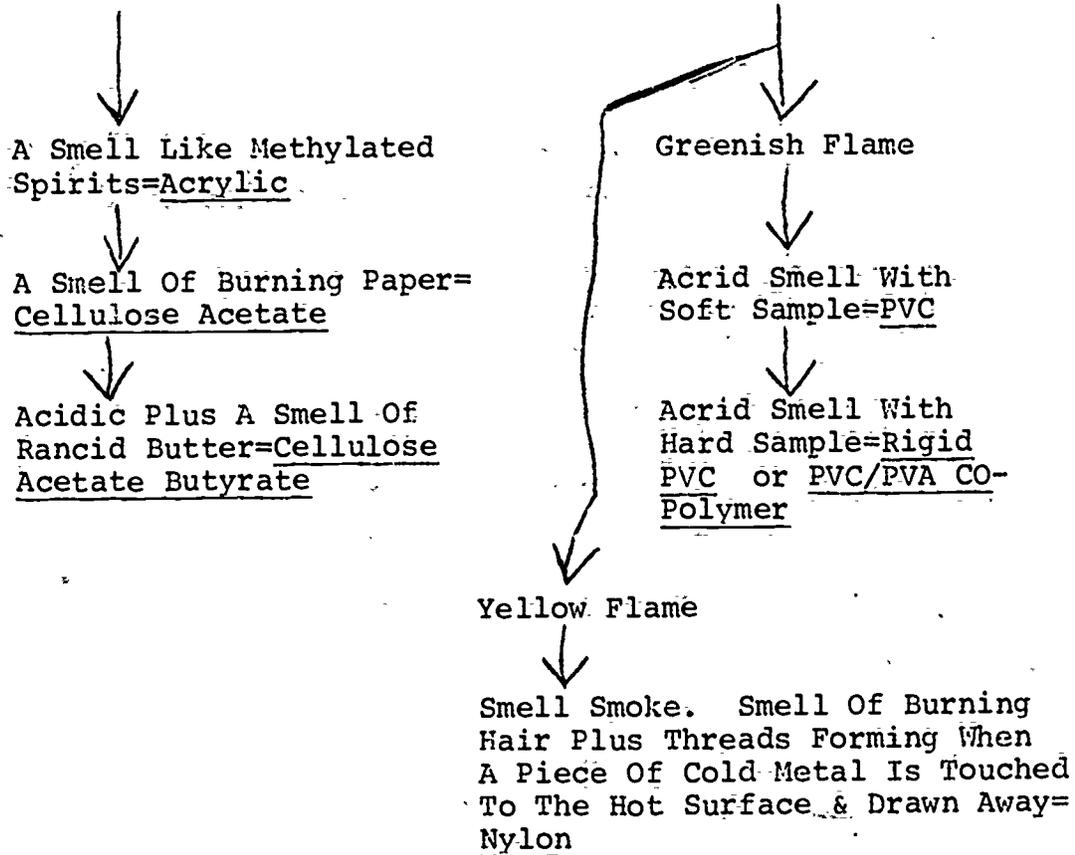
↓
Greenish

↓
Acrid Smell
Soft Sample

↓
Acrid Smell
Hard Sample
PVC or
Polymer

↓
Yellow Flame

↓
Smell Smoke. Smell
Hair Plus Threads
A Piece Of Cold Metal
To The Hot Surface.
Nylon



Pel 7/72

C 10. Short-term economic gains
 O may produce long-term environmental
 N losses.
 C
 E
 P
 T

Discipline Area Industrial
 Subject Plastics
 Problem Orientation Disposal
Plastic

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will list the ways plastic has replaced wood, metal, and glass due to economic factors. The student will list the problems of plastic disposal.
Affective: The student will buy products made of recyclable materials rather than thermoplastics.

Skills to be Learned
Methods of disposal of used wood, metal, glass and plastic products.

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
 - A. Students will develop a list of products once made of metal, wood or glass and now, because of economic factors, made of plastic.
 - B. Students will study methods of disposing of used products made of wood, metal, glass, & plastic.
 - 1. Metal-recycle
 - 2. Glass-recycle
 - 3. Wood-burn, salvage
 - 4. Plastic
 - A. Thermoset
 - B. Thermoplastic-recycle
 - C. Students will study the problem of disposal of thermosetting plastics,
 - 1. Study current problems of disposal
 - A. Can not burn in normal fire.
 - B. Does not decay
 - C. Non-recyclable (Con't)

II. Out
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1 Environmental

Discipline Area Industrial Arts

Subject Plastics

Problem Orientation Disposal of Used Grade 9-12
Plastic Products

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Students will develop a list of products once made of metal, wood or glass and now, because of economic factors, made of plastic.
 - B. Students will study methods of disposing of used products made of wood, metal, glass, & plastic.
 - 1. Metal-recycle
 - 2. Glass-recycle
 - 3. Wood-burn, salvage
 - 4. Plastic
 - A. Thermoset
 - B. Thermoplastic-recycle
 - C. Students will study the problem of disposal of thermosetting plastics,
 - 1. Study current problems of disposal
 - A. Can not burn in normal fire.
 - B. Does not decay
 - C. Non-recyclable (Con't)

- II. Outside Resource and Community Activities
- Operator of Recycling center.
 - Visit a hammer mill.

Resource and Reference Materials	Continued and Additional Suggested Learning	Con
<p data-bbox="293 882 666 1010"> <u>Publications:</u> <u>Plastics Technology,</u> Robert S. Swanson McKnight & McKnight </p> <p data-bbox="293 1173 857 1308"> <u>Audio-Visual:</u> <u>Plastics: Industrial Processes</u> <u>and Products #86000 U. of</u> Ill. Champaign, Ill </p> <p data-bbox="293 1375 820 1442"> <u>Community:</u> Operator of recycling center </p>	<p data-bbox="966 882 1712 913">2. Develop possible methods of disposal.</p>	<p data-bbox="1779 882 1816 913">2.</p>

Continued and Additional Suggested Learning Experiences

1. 2. Develop possible methods of disposal.

C
O
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C
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P
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11. Individual acts, duplicated
or compounded, produce significant
environmental alterations over
time.

Discipline Area Industrial
Subject Plastics
Problem Orientation Recycling

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will list 4 advantages of recycling thermoplastics & how his actions affect the environment.
Affective: The student will understand the cause-effect relationship utilized in recycling thermoplastics

Skills to be Learned

1. Preparing material for recycling
2. Operation of the granulator
3. Testing plastics
4. Record keeping

SUGGESTED LEARNING EXPER

- | <u>I. Student-Centered in class activity</u> | <u>II. Out Com</u> |
|--|--------------------|
| This activity is a continuation of class activity from concept #10. | 1. |
| A. Students will wash & remove all labels, metal rings, etc from plastic articles collected from school, home & community periodic collection. | 2. |
| B. Separate according to type of plastic & prepare them for the granulator & granulate | 3. |
| C. Weight material & enter weight & date on chart | 4. |
| D. At the end of the year add total weight column & compute cost of mat'rl recycled. Find per pupil input. | |
| E. Class discussion of concept #11 as it relates to class recycling effort | |
| a. Money saved (con't) | |

73

Industrial Arts

Plastics

Recycling Plastics Grade 7-12

TEACHING EXPERIENCES

II. Outside Resource and
Community Activities

1. Sanitary engineer
2. Chemistry teacher
3. Rep. from plastic industry.
4. Set up collection stations for "throw away" plastic articles & maintain same.

Resource and Reference Materials

Continued and Additional Suggested

Publications:

Woodworkers Annual Vol 73
V. J. Taylor Drake Pub. Ltd.
440 Park Ave. South, N.Y. 10016
General Plastics, Raymond
Cherry McKnight & McKnight
Bloomington, Ill.

Audio-Visual:

Carbage, Project I-C-E RMC

Community:

1. Sanitary engineer
2. Chemistry teacher
3. Rep. from plastics industry

(Con't from I.)

- b. Mat'rl saved
- C. Land fill effect
- d. Conservation of natural resour
1. Do long term record keeping ov
a greater impact value is deve

Continued and Additional Suggested Learning Experiences

(Con't from I.)

b. Mat'rl saved

c. Land fill effect

d. Conservation of natural resources

1. Do long term record keeping over the years so that a greater impact value is developed.

C 12. Private ownership must be
 O regarded as a stewardship and Discipline Area Industrial
 N should not encroach upon or Subject Plastics
 C violate the individual right of Problem Orientation Rights
 E others.

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p><u>Cognitive:</u> The student will list 3 consequences that might result if the previous "owner" encroached on his rights. List cause & effect.</p> <p><u>Affective:</u> The student will realize that his actions determine not only project & work of all of his classmates.</p>	<p>I. Student-Centered in class activity Understanding should be realized that when a person is working in an individual effort, the materials, machines, tools etc. he is using are "his" to use until he is finished. He is also responsible for these materials. Thus, the student is the "owner" of items or materials being used.</p> <p>A. Demonstration & explanation by teacher on fiberglass resin-mix preparation 1. Ingredients (simple) a. Resin b. Hardener</p> <p>B. Discussion of failures as a result of improper preparation. 1. If "owner" is not careful and gets resin or hardener into main storage of other, the (Con't)</p>	<p>II. Outcomes</p>
<p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. Proportions 2. Accuracy in measuring 3. Set-up times of resins 4. Responsibility of own actions. 		

must be

ship and

Discipline Area Industrial Arts

on or

Subject Plastics

right of

Problem Orientation Rights Of Others Grade 10-12

SUGGESTED LEARNING EXPERIENCES

I. Student-Centered in class activity

Understanding should be realized that when a person is working in an individual effort, the materials, machines, tools etc. he is using are "his" to use until he is finished. He is also responsible for these materials. Thus, the student is the "owner" of items or materials being used.

A. Demonstration & explanation by teacher on fiberglass resin-mix preparation

1. Ingredients (simple)
2. a. Resin
- b. Hardener

B. Discussion of failures as a result of improper preparation.

1. If "owner" is not careful and gets resin or hardener into main storage of other, the
(Con't)

II. Outside Resource and Community Activities

Resource and Reference Materials	Continued and Additional Suggested Learning
<p data-bbox="313 873 555 907"><u>Publications:</u></p> <p data-bbox="313 907 672 1008"><u>Fiber-Glass</u> Gerald L. Steele McKnight & McKnight</p> <p data-bbox="313 1164 815 1310"><u>Audio-Visual:</u> Resin Mixing Ingredients in Singular Form, & Comparison Display in Mixed Form</p> <p data-bbox="313 1433 492 1467"><u>Community:</u></p>	<p data-bbox="976 884 1693 985">(Con't from I.) entire mass will be worthless, & no other will be able to use it.</p> <p data-bbox="976 985 1693 1120">2. If batch of resin is not thoroughly resin & resulting product will be weak Stress--each person's project or work is upon past performances of other students</p> <p data-bbox="976 1120 1693 1187">3. Discover as many areas as possible where by one individual will affect many others</p>

Materials	Continued and Additional Suggested Learning Experiences
<p>arn</p> <p>oth</p> <p>ly</p> <p>wo</p> <p>k i</p> <p>ent</p> <p>e w</p> <p>y o</p> <p>ents in parison m</p>	<p>(Con't from I.)</p> <p>entire mass will be worthless, & no other student will be able to use it.</p> <p>2. If batch of resin is not thoroughly mixed, the resin & resulting product will be worthless.</p> <p>Stress--each person's project or work is dependent upon past performances of other students or "owners"</p> <p>3. Discover as many areas as possible where neglect by one individual will affect many others.</p>

C 1. Energy from the sun, the basic
 O source of all energy, is converted
 N through plant photosynthesis into
 E a form all living things can use
 P for life processes.
 T

Discipline Area Industrial
 Subject Electricity
 Problem Orientation Application
 Energy

ESEA Title III - 59-70-0135-2 Project I-C-F

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p><u>Cognitive:</u> The student will develop an experiment using sun energy & explain how his results can be applied to our technological society.</p> <p><u>Affective:</u> The student will describe several problems in using sun energy</p>	<p>I. Student-Centered in class activity</p> <p>A. Telephone company rep. presentation "uses of sun energy"</p> <p>B. Film (presentation</p> <p>1. Electrical sources</p> <p>2. Production</p> <p>C. Read related text units</p> <p>D. The students will write a philosophical (dream) paper on sun energy use & its application to our society.</p> <p>E. By individuals or small groups develop sun energy experiments</p> <p>F. Suggest several environmental problems associated with construction & operations of solar energy power generators as described in July 1972 Popular Science</p> <p>G. Review use of Solar energy on space probe vehicles by NASA</p>	<p>II. Outside</p> <p>Comm</p> <p>1. T</p> <p>2. I</p> <p>3. V</p> <p>4. P</p> <p>5. I</p>
<p><u>Skills to be Learned</u></p> <p>1. Experiment design</p> <p>2. Cause-effect thinking</p> <p>3. Testing</p> <p>4. Brainstorming</p> <p>5. Circuitry & wiring</p>		

Energy from the sun, the basic
 source of all energy, is converted
 through plant photosynthesis into
 a form all living things can use
 in life processes.

Discipline Area Industrial Arts
 Subject Electricity-Electronic
 Problem Orientation Application of Sun Grade 7-12
Energy

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p>Objective: The student will develop an experi- ment using sun energy and in how his results are applied to our biological society. Objective: The student will describe several uses in using sun</p>	<p>I. Student-Centered in class activity</p> <p>A. Telephone company rep. presentation "uses of sun energy"</p> <p>B. Film presentation 1. Electrical sources 2. Production</p> <p>C. Read related text units</p> <p>D. The students will write a philosophical (dream) paper on sun energy use & its application to our society.</p> <p>E. By individuals or small groups develop sun energy experiments</p> <p>F. Suggest several environmental problems associated with construction & operations of solar energy power generators as described in July 1972 Popular Science</p> <p>G. Review use of Solar energy on space probe vehicles by NASA</p>	<p>II. Outside Resource and Community Activities</p> <ol style="list-style-type: none"> 1. Telephone Co. 2. Local power co. 3. Weather man 4. Physics teacher 5. In the community the students will locate direct uses of sun energy
<p>to be Learned experiment design cause-effect thinking planning brainstorming circuitry & wiring</p>		

Resource and Reference Materials

Publications:

Modern General Shop ,
Walter Brown
Goodheart-Willcox Co.
Popular Science, July 1972

Audio-Visual:

#53623 Electricity: Electrical Sources
#62900 Electricity: Production
Univ. Of Ill, Champaign, Ill.

Community:

1. Telephone Co.
2. Local power co.
3. Weather co.
4. Physics teacher

Bell telephone educational representatives 1-922-5211
Collect call Miss A. Hoey
Fond Du Lac for available supplies & films

Continued and Additional Suggested Learning Ex

1. Continue developing experiments that show the greatest potential & possible patent and/or

Solar generation will require large amounts of radiation regularly available. Agricultural industrial development in this (desert type) can cause climatic change that reduces the conversion capacity of the solar generation

Materials	Continued and Additional Suggested Learning Experiences
<p>1972</p> <p><u>Electrical</u></p> <p><u>Production</u></p> <p>Ill.</p> <p>ional</p> <p>5211</p> <p>oey</p> <p>able</p>	<p>1. Continue developing experiments that show the greatest potential & possible patent and/or copyright.</p> <p>Solar generation will require large amounts of solar radiation regularly available. Agricultural or industrial development in this (desert type) area can cause climatic change that reduces the efficient conversion capacity of the solar generation bank.</p>

C
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1. Energy from the sun, the basic source of all energy, is converted through plant photosynthesis into a form all living things can use for life processes.

Discipline Area Industrial

Subject Electricity

Problem Orientation Application
Energy

ESEA Title III - 59-70-0135-2 Project I-C-F

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p><u>Cognitive:</u> The student will develop an experiment using sun energy & explain how his results can be applied to our technological society.</p> <p><u>Affective:</u> The student will describe several problems in using sun energy</p>	<p>I. Student-Centered in class activity</p> <p>A. Telephone company rep. presentation "uses of sun energy"</p> <p>B. Film (presentation</p> <p>1. Electrical sources</p> <p>2. Production</p> <p>C. Read related text units</p> <p>D. The students will write a philosophical (dream) paper on sun energy use & its application to our society.</p> <p>E. By individuals or small groups develop sun energy experiments</p> <p>F. Suggest several environmental problems associated with construction & operations of solar energy power generators as described in July 1972 Popular Science</p> <p>G. Review use of Solar energy on space probe vehicles by NASA</p>	<p>II. Out of class</p> <p>Conferences</p> <p>1. ...</p> <p>2. ...</p> <p>3. ...</p> <p>4. ...</p> <p>5. ...</p>
<p><u>Skills to be Learned</u></p> <p>1. Experiment design</p> <p>2. Cause-effect thinking</p> <p>3. Testing</p> <p>4. Brainstorming</p> <p>5. Circuitry & wiring</p>		

the sun, the basic
 energy, is converted
 photosynthesis into
 things can use
 ses.

Discipline Area Industrial Arts
 Subject Electricity-Electronic
 Problem Orientation Application of Sun Grade 7-12
Energy

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
Out- Com- 1. Energy 2. results 3. our 4. ety. 5. ent cal sun	I. Student-Centered in class activity A. Telephone company rep. presentation "uses of sun energy" -- B. Film (presentation 1. Electrical sources 2. Production C. Read related text units D. The students will write a philosophical (dream) paper on sun energy use & its application to our society. E. By individuals or small groups develop sun energy experiments F. Suggest several environmental problems associated with construction & operations of solar energy power generators as described in July 1972 Popular Science G. Review use of Solar energy on space probe vehicles by NASA	II. Outside Resource and Community Activities 1. Telephone Co. 2. Local power co. 3. Weather man 4. Physics teacher 5. In the community the students will locate direct uses of sun energy
ed y nking		
ing		

Resource and Reference Materials	Continued and Additional Sugg
<p data-bbox="615 954 864 985"><u>Publications:</u></p> <p data-bbox="615 985 1005 1049">Modern General Shop , Walter Erown Goodheart-Willcox Co.</p> <p data-bbox="615 1080 1103 1116"><u>Popular Science</u>, July 1972</p> <p data-bbox="615 1216 861 1247"><u>Audio-Visual:</u></p> <p data-bbox="615 1247 1178 1311">#53623 <u>Electricity: Electrical Sources</u></p> <p data-bbox="615 1311 1178 1375">#62900 <u>Electricity: Production</u> Univ. Of Ill, Champaign, Ill.</p> <p data-bbox="615 1482 808 1513"><u>Community:</u></p> <ol data-bbox="615 1513 953 1644" style="list-style-type: none"> 1. Telephone Co. 2. Local power co. 3. Weather co. 4. Physics teacher <p data-bbox="615 1680 1104 1834">Bell telephone educational representatives 1-922-5211 Collect call Miss A. Hoey Fond Du Lac for available supplies & films</p>	<p data-bbox="1215 961 1787 1025">1. Continue developing experime greatest potential & possibl</p> <p data-bbox="1264 1061 1787 1223">Solar generation will requir radiation regularly availabl industrial development in th can cause climatic change th conversion capacity of the s</p>

Continued and Additional Suggested Learning Experiences

1. Continue developing experiments that show the greatest potential & possible patent and/or copyright.

Solar generation will require large amounts of solar radiation regularly available. Agricultural or industrial development in this (desert type) area can cause climatic change that reduces the efficient conversion capacity of the solar generation bank.

7

C 2. All living organisms interact
 O among themselves and their
 N environment, forming an intricate
 C unit called an ecosystem.

Discipline Area Industrial
 Subject Electricity
 Problem Orientation Relation
The Electrical Circuit t

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPER	
<p><u>Cognitive:</u> The student will in writing compare a community to an electrical circuit and explain what happens if one part stops, changes, etc.</p> <p><u>Affective:</u> The student will realize the interaction of the electrical circuit & the effects if one or more fail.</p>	<p>I. Student-Centered in class activity</p> <p>A. Film presentations:</p> <ol style="list-style-type: none"> 1. Flow of electricity 2. Elementals of electrical circuits <p>B. Using components develop & explain a simple electrical circuit. Teacher or student.</p> <p>C. Have students identify circuit components</p> <ol style="list-style-type: none"> 1. Power 2. Load 3. Return wire 4. Gauges 5. Protection <p>D. Evaluate circuit Test - Result</p> <ol style="list-style-type: none"> 1. Design - Works 2. Vary Load-Blow fuse Burn wire 3. Vary power-Load doesn't work 4. Break circuit-Won't work <p>E. Compare circuits to a community, class discussion, groups, or homework (Con't)</p>	<p>II. Out</p> <p>Com</p> <p>A.</p> <p>B.</p>
<p><u>Skills to be Learned:</u></p> <ol style="list-style-type: none"> 1. Principles of an electrical circuit 2. Systems analysis 3. Primary circuit elements <ol style="list-style-type: none"> A. Volts B. Amps C. Ohms 		

Discipline Area Industrial Arts

Subject Electricity-Electronic

Problem Orientation Relationship of Grade 7-12
The Electrical Circuit to an Ecosystem

SUGGESTED LEARNING EXPERIENCES

Centered in class

presentations:
flow of electricity
elements of electrical circuits
components develop
draw a simple electrical circuit. Teacher or student.
students identify
circuit components
power
load
return wire
fuses
protection
complete circuit
- Result
design - Works
overload - Blow fuse
Burn wire
no power - Load doesn't
work
break circuit - Won't work
draw circuits to a
community, class discussion,
groups, or homework (Cont)

II. Outside Resource and
Community Activities

- A. Sociologist
- B. Have students find examples in the community & relate them to the basic circuit & its function.

Resource and Reference Materials	Continued and Additional Suggested
<u>Publications:</u> <u>Interior Electric Wiring</u> Kennard C. Graham American Tech. Society Chicago, Ill. <u>Electrical Construction Wiring</u> Walter N. Alerich American Tech. Society Chicago, Ill.	1. Power=Food, fuel, etc. 2. Load=People, demand (Con't f 3. Return wire=Waste disposal 4. Gauges=Communication 5. Protection=Limiting factors avai food, etc.
<u>Audio-Visual:</u> <u>Flow of Electricity, BAVI</u> #29800 <u>Elements of Electrical</u> <u>Circuits,</u> Univ. of Ill. Champaign, Ill.	
<u>Community:</u> 1. Sociologist	

and Additional Suggested Learning Experiences

Food, fuel, etc. (Con't from I. E.)
people, demand

wire=Waste disposal

=Communication

tion=Limiting factors available land, housing,
etc.

C 3. Environmental factors are limiting
 O on the numbers of organisms living
 N within their influence, thus, each
 C environment has a carrying capacity.

Discipline Area Industrial
 Subject Electric
 Problem Orientation Determining Carrying

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: Given a fixed power source, the student will experiment to find its maximum capacity, and then compute this capacity using mathematics.
Affective: The student will realize that there is a limit to the load a circuit or system can handle.

Skills to be Learned

1. Electrical computations
2. Load capacities
3. Function of fuses

SUGGESTED LEARNING EXPERIENCES

- | | |
|---|------------|
| <p>I. Student-Centered in class activity</p> <p>A. Have each student load a fused (20 amp) circuit with household appliances until it becomes overloaded</p> <ol style="list-style-type: none"> 1. Toaster 2. Coffee pot 3. Electric fry pan, etc. <p>B. Discuss circuit handling capacity, and how to compute Amps</p> <ol style="list-style-type: none"> 1. Amps=Watts/volts 2. Sum of amps. drawn by each appliance cannot be larger than supply amperage. <p>C. Have students design and set up different appliance combinations which will not overload circuit.</p> <p>D. Discuss safety factors concerning electrical house circuits</p> <ol style="list-style-type: none"> 1. Nat. elec. code-80% of amperage maximum 2. Fire hazards <p>(Con't)</p> | <p>II.</p> |
|---|------------|

rs are limiting

isms living Discipline Area Industrial Arts

thus, each Subject Electricity-Electronics

ing capacity. Problem Orientation Determining Grade 7-12
Carrying Capacities

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Have each student load a fused (20)Amp) circuit with household appliances until it becomes overloaded
 - 1. Toaster
 - 2. Coffee pot
 - 3. Electric fry pan, etc.
 - B. Discuss circuit handling capacity, and how to compute Amps
 - 1. Amps=Watts/volts
 - 2. Sum of amps. drawn by each appliance cannot be larger than supply amperage.
 - C. Have students design and set up different appliance combinations which will not overload circuit.
 - D. Discuss safety factors concerning electrical house circuits
 - 1. Nat. elec. code-80% of amperage maximum
 - 2. Fire hazards
- (Con't)

- II. Outside Resource and Community Activities
- A. Electrician
 - B. Have students survey neighborhood for hazardous electrical wiring situations, start a drive to re-work or have something done about inferior wiring facilities
 - C. Public Service rep.
 - D. Underwriters lab.

Resource and Reference Materials	Continued and Additional Suggested Learning Activities
<p data-bbox="453 913 700 943"><u>Publications:</u></p> <p data-bbox="453 943 1020 978"><u>Electricity</u>, Goodheart-Wilcox Howard H. Gerrish</p> <p data-bbox="453 1008 1020 1043"><u>Basic Electricity</u>, McGraw Hill Paul B. Zbar</p> <p data-bbox="453 1073 1001 1171"><u>Introduction to Electricity & Electronics</u>, Delmar Loper & A.H.R.</p> <p data-bbox="453 1201 700 1236"><u>Audio-visual:</u></p> <p data-bbox="453 1236 849 1333">Transparencies to Aid Explanation of Ampere Computation</p> <p data-bbox="453 1364 639 1399"><u>Community:</u></p> <ol data-bbox="453 1399 1066 1533" style="list-style-type: none"> 1. Electrician 2. Public service rep. 3. Possibly rep. from Underwriters laboratory 	<p data-bbox="1150 913 1420 948">(Con't from I.)</p> <p data-bbox="1150 948 1900 1045">E. Relate overloading problems to to earl of overcrowding and over-use of r bwd próducts.</p> <ol data-bbox="1150 1076 1900 1227" style="list-style-type: none"> 1. Conduct community wide drive to i bmm area about overloading circuits, t o local people (especially in older ple update their electrical wiring sy air

Additional Suggested Learning Experiences

.)
to overloading problems to today's problems
of crowding and over-use of resources &

o a community wide drive to inform persons in
s, at overloading circuits, and try to get
derable (especially in older homes) to
sy their electrical wiring systems.

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4. An adequate supply of pure
water is essential for life.
(also can apply to concept #5)

Discipline
Subject
Problem Or

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will be able to list 6 environmental losses caused by the production of electricity.
Affective: The student will gain knowledge of environmental loss due to the production of electricity.

Skills to be Learned
How electricity is produced.
How the production of electricity affects our environment.
How to develop a questionnaire.

SUGGES

- I. Student-Centered in activity
 - A. Class discussion
 - 1. What kinds of electricity are produced by the production of electricity?
 - 2. How much of electricity is produced?
 - 3. What are the effects of the production of electricity?
 - B. Students will make a bulletin board showing environmental losses by producing one of electricity by
 - 1. Burning fossil
 - 2. Water power
 - 3. Nuclear energy
 - C. Students develop a questionnaire and conduct a survey on the following question:
To reduce pollution by the production of electricity, which would rather (Con't)

Supply of pure

for life.

concept #5)

Discipline Area Industrial Arts

Subject Electricity-Electronics

Problem Orientation Production of Grade 7-12
Electricity

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
<p>1. Student-centered activity</p> <p>2. Student-centered activity</p>	<p>I. Student-Centered in class activity</p> <p>A. Class discussion on how electricity is produced:</p> <ol style="list-style-type: none"> 1. What kinds of pollution are produced by the production of electricity? 2. How much of this pollution is produced? 3. What are the environmental effects of this pollution? <p>B. Student will make a bulletin board showing environmental losses caused by producing one mega-watt of electricity by</p> <ol style="list-style-type: none"> 1. Burning fossil fuel 2. Water power 3. Nuclear energy <p>C. Students develop questionnaire and conduct community survey on the following question: To reduce pollution caused by the production of electricity which would rather do, (Con't)</p>	<p>II. Outside Resource and Community Activities</p> <p>A. Speaker from local power company.</p> <p>B. Field trips to hydro-plant nuclear plant, and fossil fuel plant.</p>
<p>3. Student-centered activity</p>		
<p>4. Student-centered activity</p>		

Resource and Reference Materials	Continued and Additional Suggested
<p><u>Publications:</u> <u>Environmental Cost of Electric Power,</u> Scientists Institute for Public Information. 30 E. 68th St. N. Y. , N. Y. 10021 <u>National Wildlife,</u> National Wildlife Federation April-May, 1972 P. 18</p> <p><u>Audio-Visual;</u> <u>Electricity: How It Is Generated.</u> #01136 U. of Ill. Champaign, Ill.</p> <p><u>Community:</u> Rep. from local power company.</p>	<p>(Con't from I.) pay 1/5 more for electricity each required to reduce use of electricity each month? D. Construction of models of the of generating stations for portable display with environment associated with construction a</p>

Continued and Additional Suggested Learning Experiences

(Con't from I.)

pay $1/5$ more for electricity each month, be required to reduce use of electricity by $1/5$ each month?

D. Construction of models of the various types of generating stations for placement in sand table display with environmental impact effects associated with construction and operation of same.

Discipline Area Industrial Arts
 Subject Electricity-Electronics
 Problem Orientation Transmission of Grade 7-12
Electrical Energy.

SUGGESTED LEARNING EXPERIENCES

I. Student-Centered in class
 Students will study how natural resource distribution affects methods of electricity production.
 How is electricity produced in states that have large supplies of water?
 How is electricity produced in states that have large supplies of coal?
 How is electricity produced in states that have large supplies of oil or natural gas?
 How is electricity supplied in areas that have none of the resources used to produce electricity?
 Students will study how man has manipulated his environment to produce and transmit electric power.

II. Outside Resource and Community Activities
 Rep. from local power company.
 Field trip to electric power plants of different types.

Resource and Reference Materials	Continued and Additional Suggested Learning
<p><u>Publications:</u> <u>Environmental Cost of Electric Power,</u> Scientists Institute for Public Information, 30 E. 68th St. N.Y., N.Y. <u>National Wildlife,</u> <u>National Wildlife Federation</u> April-May, 1972 p. 18</p> <p><u>Audio-Visual:</u> #50774 Dams University of Ill, Champaign, Ill.</p> <p><u>Community:</u> Rep. from local power company.</p>	<ol style="list-style-type: none"> 1. Building of dams to produce electricity 2. Building power transmission lines.

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Continued and Additional Suggested Learning Experiences

1. Building of dams to produce electricity. (Con't from I.)
2. Building power transmission lines.

III.

C O N C E P T 7. Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influence on changes in land use and centers of population density.

Discipline Area Industrial Art
 Subject Electricity-El
 Problem Orientation Factors in Production of New Hyd

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will list 7 considerations and their involvement in hydroelectric dam building.
Affective: The student will realize the complexity of involvements in developing hydroelectric power.

Skills to be Learned

1. Production of hydroelectric power.
2. A projects impact on the environment
3. Planning of a project

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
 - A. Have selected students read book. (Manic 5)
 - B. Panel discussion about the hydroelectric dam's environmental impact on the following areas.
 1. Transportation
 2. Natural Resources
 3. Population growth
 4. Leisure time use
 5. Economic factors
 6. Land use changes
 - C. Field trip to local hydroelectric dam (Peshtigo River has 5)
 1. Evaluate dam's environmental impact & relate to Manic 5
 - A. Changes in wildlife
 - B. Changes in land use
 - C. Changes in water quality

- II. Outside
 - A. Field
 - B. Rep

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El Electricity-Electronics

in Factors in The Grade 7-12
yd of New Hydroelectric Power

IE IING EXPERIENCES

II. Outside Resource and
Community Activities

- A. Field trip to
hydroelectric dam.
- B. Representative from
power co.

Resource and Reference Materials

Publications:

Manic 5
Modern General Shop,
Goodheart-Wilcox

Audio-Visual:

#82045 Fine Dam Builders
#50774 Dams
#53537 Man Changes the Nile
#05800 Water Power
Uni of Ill., Champaign, Ill.

Community:

1. Representative from power co.
2. Fox River, 2 power dams
near Kaukauna, 1 at Appleton,
3. Peshtigo River
4. Menominee River, Wolf River,

Continued and Additional Suggeste

1. What other uses does a hydroe
besides producing power?

Materials Continued and Additional Suggested Learning Experiences

1. What other uses does a hydroelectric dam have besides producing power?

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C 8. Cultural, economic, social, and
 O
 N political factors determine status
 C
 E of man's values and attitudes
 P
 T toward his environment.

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ESEA Title III - 59-70-0135-2 Project I-C-E	BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
	<p><u>Cognitive:</u> The student will research a specific thermal pollution alternative and write an opinion paper.</p> <p><u>Affective:</u> The student will realize the factors related to thermal pollution from atomic energy production.</p> <p><u>Skills to be Learned</u></p> <ol style="list-style-type: none"> 1. How electricity is produced by atomic energy. 2. What is thermal pollution & how do you handle it? 3. Brainstorming 4. Safety standards for Atomic energy generators. 	<p>I. Student-Centered in class activity</p> <p>A. After discussing the production of power using atomic energy, tackle the following problem: Since the water used in cooling an atomic reactor is considered thermal pollution what alternative are available?</p> <ol style="list-style-type: none"> 1. It is not a problem 2. Use a cooling tower 3. Pipe it for residential heating 4. Put pipes in road for snow & ice removal 5. Various industrial uses 6. Fish pond culture/cooling 7. Brainstorm other uses <p>B. Debate aforementioned class developed list on pros & cons</p> <p>C. What effect will warming Lake Mich. have on drinking water quality of city water (eg. Green Bay), from blue-green algae tastes?</p>

, economic, social, and

Factors determine status

Discipline Area Industrial Arts

Values and attitudes

Subject Electricity-Electronics

Environment.

Problem Orientation The Alternatives Grade 7-12
To Thermal Pollution

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

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gy production.
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mal pollution
handle it?
rds for
generators.

I. Student-Centered in class activity
A. After discussing the production of power using atomic energy, tackle the following problem:
Since the water used in cooling an atomic reactor is considered thermal pollution what alternatives are available?
1. It is not a problem
2. Use a cooling tower
3. Pipe it for residential heating
4. Put pipes in road for snow & ice removal
5. Various industrial uses
6. Fish pond culture/cooling
7. Brainstorm other uses
B. Debate aforementioned class developed list on pros & cons.
C. What effect will warming Lake Mich. have on drinking water quality of city water (eg. Green Bay), from blue-green algae tastes?

II. Outside Resource and Community Activities
1. Rep. from AEC
2. Discover within the community other sources of thermal pollution.
3. Marine biologist/limnologist
4. Fishery biologist, DNR
5. Site visitation, visitor center, Point Beach Nuclear Plant, Two Creeks, Wis. (highly recommended)

Resource and Reference Materials

Publications:

Literature from AEC
Address below.

Audio-Visual:

Power & Promise

AEC Chicago Operations Office
Office of Information
9800 S. Cass Ave.
Argonne, Ill., 60439

Community:

1. AEC -- (Atomic Energy Commission)
2. Marine biologist - U.W. Green
Bay
3. DNR Fishery division
4. Wisconsin Mich. Power Co.
Appleton, Wis (co-operators
of Point Beach Nuclear
Reactor.
5. Wisconsin Public Service
(operator of Carlton Nuclear
Reactor)

Continued and Additional Suggested Reading

1. With 2 aquariums set up with fish
induce thermal pollution & observe

Technical note: Temperatures above 80
become damaging to most warm water fish
above 70-75 degrees become damaging to
water fish such as trout & white fish

Materials

Continued and Additional Suggested Learning Experiences

1. With 2 aquariums set up with fish & vegetation, induce thermal pollution & observe results.

Technical note: Temperatures above 85-90 degrees become damaging to most warm water fish. Temperature above 70-75 degrees become damaging to most cold water fish such as trout & white fish.

Office

Commission
Green

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Nuclear

CONCEPT 10. Short-term economic gains
 may produce long-term environmental losses.
 Discipline Area Industrial
 Subject Electricity
 Problem Orientation Proper

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING EXPERIENCES
Cognitive: The student will list 3 areas in house wiring where meeting code minimums may prove insufficient over a period of time, & why. Affective: The student will realize the need for planning ahead in house wiring and using proper materials even though the cost may be higher.	I. Student-Centered in class activity A. Presentation on local electrical building codes and requirements by building inspector or local electrician. B. Discuss why these codes should be met and even exceeded. 1. Added appliances in future. 2. Failure of minimum facilities C. Introduce and discuss flat-rate book for electrical work-new work vs. remodeling. (Minimal equipment & facilities will have to be replaced as time goes on & other appliances are added, etc.) 1. Install outlet-new-\$15.00 2. Install Outlet-remodel work-\$30.00 D. Brainstorm wastes brought about by necessity of re-wiring (Con't)
<u>Skills to be Learned</u> 1. Cost analysis sheets 2. Electrical codes	

Short-term economic gains

Reduce long-term environmental

Discipline Area Industrial Arts

Subject Electricity-Electronics

Problem Orientation Proper Home Wiring Grade 9-12

GENERAL OBJECTIVES

The student
areas in
where
minimums
insufficient
of time,

The student
the need
ahead in
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Learned
analysis sheets
al codes

SUGGESTED LEARNING EXPERIENCES

- I. Student-Centered in class activity
- A. Presentation on local electrical building codes and requirements by building inspector or local electrician.
 - B. Discuss why these codes should be met and even exceeded.
 - 1. Added appliances in future.
 - 2. Failure of minimum facilities
 - C. Introduce and discuss flat-rate book for electrical work-new work vs. remodeling.
(Minimal equipment & facilities will have to be replaced as time goes on & other appliances are added, etc.)
 - 1. Install outlet-new-\$15.00
 - 2. Install Outlet-remodel work-\$30.00
 - D. Brainstorm wastes brought about by necessity of re-wiring
(Con't)

- II. Outside Resource
Community Activities
- 1. Building inspector
 - 2. Local electrician
 - 3. Local contractor

Resource and Reference Materials

Publications:

1. Contractors Flat-Rate Manual
2. National Electrical Code
National Fire Protection Assoc.
3. Wisconsin Administrative Code
Public Service Commission

Audio-Visual:

Community:

1. Local electrician
2. Local contractor
3. Building inspector

Continued and Additional Suggested Learning

(Con't from I. D)

1. Natural resources in building material must be dismantled.
 2. Copper from wire which must be discarded
 3. Time needed to make necessary changes
-
1. Set up model or mock-up of wall section
students actually install an outlet (if possible)
Now put in inside wall covering (ie. plaster)
have students install outlet in finished wall
Note difference in time & effort involved

als Continued and Additional Suggested Learning Experiences

(Con't from I. D)

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|-------|--|
| al | 1. Natural resources in building materials of walls must be dismantled. |
| ssoc. | 2. Copper from wire which must be discarded & replaced |
| ode | 3. Time needed to make necessary changes |
| | 1. Set up model or mock-up of wall section & have students actually install an outlet (in bare framing) Now put in inside wall covering (ie. paneling) and have students install outlet in finished wall. Note difference in time & effort involved. |

C 11. Individual acts, duplicated
 O or compounded, produce significant Discipline Area In
 N environmental alterations over time. Subject El
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 E
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 T Problem Orientation

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES	SUGGESTED LEARNING
<p><u>Cognitive:</u> The student will be able to construct an electromagnet, and vary its carrying capacity. <u>Affective:</u> The student will realize that every individual act changes the system of which it is a part.</p>	<p>I. Student-Centered in class activity A. Students will study the methods of increasing the strength of an electromagnet. 1. Increase current 2. Increase turns of wire. 3. Increase size of core 4. Change core material B. Students will make an electromagnet and keep adding turns of wire until current flow is too low and system fails. C. Discuss how A. & B. relate to environmental problems. 1. Throwing paper on streets. 2. Too many taps on water line. 3. Overloading sewage plants 4. Overloading power supply.</p>
<p><u>Skills to be Learned</u> How to make an electromagnet. How to increase the force of an electromagnet. How individual acts compound</p>	

Individual acts, duplicated

ded, produce significant

Discipline Area Industrial Arts

ical alterations over time.

Subject

Electricity-Electronics

Problem-Orientation Magnetism

Grade 7-12

OBJECTIVES

SUGGESTED LEARNING EXPERIENCES

student
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ing capacity.
student
at every
changes
which it

- I. Student-Centered in class activity
- A. Students will study the methods of increasing the strength of an electromagnet.
1. Increase current
 2. Increase turns of wire.
 3. Increase size of core
 4. Change core material
- B. Students will make an electromagnet and keep adding turns of wire until current flow is too low and system fails.
- C. Discuss how A. & B. relate to environmental problems.
1. Throwing paper on streets.
 2. Too many taps on water line.
 3. Overloading sewage plants
 4. Overloading power supply.

- II. Outside Resource and Community Activities
- Rep. from telephone co. to speak on electromagism.

earned
electro-
e the force
agnet.
acts compound

Resource and Reference Materials

Continued and Additional Suggeste

Publications:

Modern General Shop,
Walter C. Brown
Goodhearth-Willcox
Introduction To Electricity,
and Electronics,
Loper and AFR
Delmar Publisher

Audio-Visual:

Electromagnets: How They
Work #01153
University of Ill., Champaign,
Ill.
Ferromagnetic Domain Unit
Bell Telephone Co.

Community:

Rep. from telephone co.

Materials Continued and Additional Suggested Learning Experiences

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12. Private ownership must be

regarded as a stewardship and

should not encroach upon or violate

the individual right of others.

Discipline Area

Subject

Problem Orientati

ESEA Title III - 59-70-0135-2 Project I-C-E

BEHAVIORAL OBJECTIVES

Cognitive: The student will show in writing the relationship of the FCC-OPER-BCI-TVI & give 3 specific examples.
Affective: The student will become aware that transmitter operation carries responsibilities to others.

- Skills to be Learned
1. Transmitter design, tuning & operation.
 2. FCC rules & regs. (rights of others)
 3. Licensing procedures.

SUGGESTED LEA

- I. Student-Centered in class activity
 - A. What effects are produced by an improperly tuned R.F. transmitter/antenna
 1. Inefficiency
 2. Improper coupling
 3. Chirping
 4. R.F. shift
 5. Over/under modulation
 6. Harmonics
 - B. Why must BCI & TVI be cured
 1. Rights of others
 2. Pride of operation
 3. FCC Rules & regulation (The FCC monitors to protect rights of others & to insure proper operation of the station)
 - C. Discuss cause & effect between A & B.
 - D. What can be done to cure BCI & TVI
 1. Tune & design trans. equip. properly (discuss various stages of tra

nership must be

stewardship and

Discipline Area Industrial Arts

coach upon or violate

Subject Electricity-Electronics

right of others.

Problem Orientation BCI & TVI & Gradell-12
Rights of Others

OBJECTIVES	SUGGESTED LEARNING EXPERIENCES	
Identify the effects of BCI & TVI on the rights of others.	<p>I. Student-Centered in class activity</p> <p>A. What effects are produced by an improperly tuned R.F. transmitter/antenna</p> <ol style="list-style-type: none">1. Inefficiency2. Improper coupling3. Chirping4. R.F. shift5. Over/under modulation6. Harmonics <p>B. Why must BCI & TVI be cured?</p> <ol style="list-style-type: none">1. Rights of others2. Pride of operation3. FCC Rules & regulations (The FCC monitors to protect rights of others & to insure proper operation of the station) <p>C. Discuss cause & effect between A & B.</p> <p>D. What can be done to cure BCI & TVI</p> <ol style="list-style-type: none">1. Tune & design trans. equip. properly (discuss various stages of trans.)	<p>II. Outside Resource and Community Activities</p> <ol style="list-style-type: none">1. Local first class radio-TV engineer2. Rep. from FCC (U.S. Courthouse, 219 S. Clark St., Chicago, Ill.)3. Radio & TV repairmen

Materials Continued and Additional Suggested Learning Experiences

1. Establish & operate a "ham station" & encourage students to earn "ham tickets"

PROJECT I-C-E Episode Evaluation Form (Reproduce on CT

Please fill in:
 Subject: _____
 Grade: _____
 Concept No. Used: _____

In commenting on each episode use this form. Feel free to adapt it and add your critiques and comments - negative in the left hand column, please rate (poor, good) in the right hand column, make specific comments or suggestions provided to help us make this a more useful

Poor	Good	Exc.	
			I. Behavioral Objectives A. Cognitive:
			B. Affective:
			II. Skills Developed
			III. Suggested Learning Experiences A. In Class:
			B. Outside & Community Activities:
			IV. Suggested Resource & Reference Materials (specific suggestions & comments)

CT I-C-E Episode Evaluation Form (Reproduce or duplicate as needed)

In commenting on each episode used in your class, please use this form. Feel free to adapt it and add more pages. Let us know all your critiques and comments - negative and positive. In the left-hand column, please rate (poor, good, excellent) each item. Also, make specific comments or suggestions if possible in the space provided to help us make this a more usable guide. Thank you.

I. Behavioral Objectives

A. Cognitive:

B. Affective:

II. Skills Developed

III. Suggested Learning Experiences

A. In Class:

B. Outside & Community Activities:

IV. Suggested Resource & Reference Materials
(specific suggestions & comments)

Project I-C-E
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